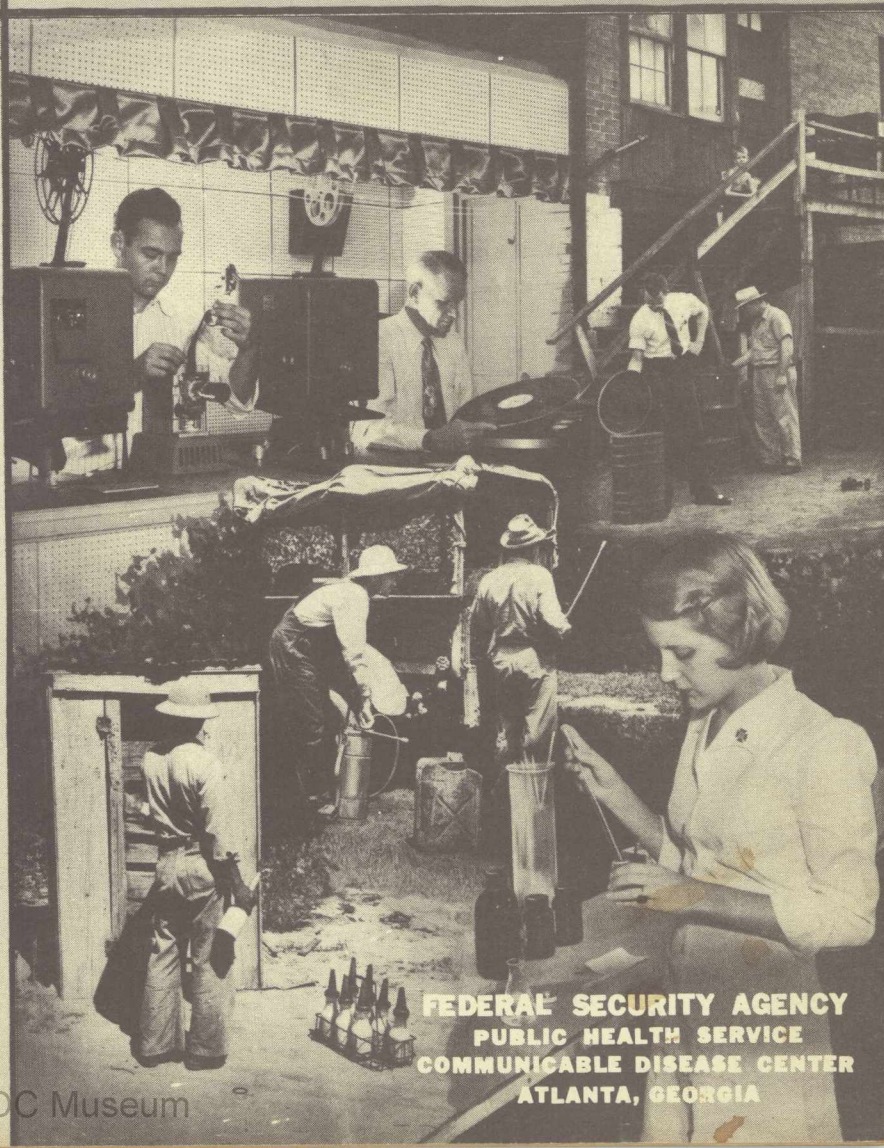


# CDC BULLETIN

JUNE 1951

## CENTER

## HIGH-RISES



FEDERAL SECURITY AGENCY  
PUBLIC HEALTH SERVICE  
COMMUNICABLE DISEASE CENTER  
ATLANTA, GEORGIA



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**FEDERAL SECURITY AGENCY**  
**Public Health Service**  
**Communicable Disease Center**  
**Atlanta, Georgia**

The printing of this publication has been approved by the Director of the Bureau of the Budget, January 19, 1950.

# CENTER HIGHLIGHTS

JAN - FEB - MAR 1951

## ADMINISTRATIVE SERVICES

### GENERAL

Responsibility for the planning, direction, and accomplishment of the move of most of the Services of CDC into the new location at 50 Seventh Street, Atlanta, Ga., was delegated to Administrative Services. This move was accomplished economically, efficiently, and with as little disruption in routine activity as possible. After the actual transfer of furniture and equipment was finished, numerous adjustments and arrangements were made.

The move into the new building brought together for the first time all sections of Administrative Services except the Motor Base and Warehouse.

The Maintenance Unit was transferred from Engineering Services to the Supply Section of Administrative Services during the closing days of the quarter.

### FEDERAL INSURANCE CONTRIBUTIONS ACT

Effective January 1, 1951, all civil service personnel not subject to the civil service retirement system became subject to the Federal Insurance Contributions Act. Approximately 234 employees are subject to this deduction.

### PER DIEM RATE

Supplement 4 to Administrative Letter No. 138, dated February 28, 1951, was issued to explain the maximum per diem rate for civilian personnel which was increased from \$8.40 to \$9.00 effective March 1, 1951.

Joint Travel Regulations for Commissioned Officers provide for a \$9.00 maximum per diem rate and for an increase to 6 cents per mile for travel in connection with permanent change of station. Administrative Letter No. 179 pertaining to travel allowances was issued March 23, 1951.

### NEW FISCAL REPORT

A new fiscal report "Status of F. Y. 1951 Funds - By Allocation" was prepared and furnished the operating units of CDC. This report is composed of two parts: (1) the Status of the F. Y. 1951 Funds - By Allocations, and (2) a detailed listing of personal services charged to the allocation. The purpose of the report is to furnish to operating officials comprehensive information which may be readily applied to budgetary estimating and fiscal control. Regulations governing this report are set forth in Administrative Letter No. 2, dated April 20, 1951.

### PERSONNEL ACTIVITIES

The "generalist" plan of personnel administration was placed in operation during March. Under this plan each technician will serve assigned organizational units in connection with classification, placement, training, and employee relations activities.

### EMPLOYEE AWARDS PROGRAM

Three recommendations were approved and forwarded to the Bureau of State Services for consideration. One suggestion was rejected by the local committee. Two suggestions are pending action by the local committee.

### MANUSCRIPTS EDITED, CLEARED

Thirty-nine manuscripts as follows were edited and cleared for presentation and/or publication: Ajello, L., Grant, V. Q., and Gutske, M. A.: The effect of tubercle bacillus concentration procedures on fungi causing pulmonary mycoses. Ajello, L., and Zeidberg, L. D.: Isolation of *Histoplasma capsulatum* and *Allescheria Boydii* from soil.



- Andrews, J. M.: Book review, medical entomology with special reference to the health and well-being of man and animals.
- Bellamy, R. E.: An investigation of the taxonomic status of *Anopheles perplexens* Ludlow, 1907.
- Blanks, J. P.: Effectiveness of electric immersion heating units in maintaining disinfectant water for dishes in small restaurants.
- Bradley, G. H.: Public health interests in mosquito control.
- Bradley, G. H., and Lyman, F. E.: Mosquito control activities of Communicable Disease Center.
- Breeland, S. G.: Aides to identification of larvae of some common anophelines of south Georgia.
- Bright, J. H., and Stephens, P. A.: Description of a mobile power type insect control unit.
- Chamberlain, R. W., Rubin, H., Kissling, R. E., and Eidson, M. E.: Recovery of the virus of Eastern equine encephalomyelitis from a mosquito, *Culiseta melanura* (Coquillett).
- Clark, W. H., Lennette, E. H., Railsback, O. C., and Romer, M. S.: Q fever in California - VII. Clinical features in 180 cases.
- Clark, W. H., Romer, M. S., Holmes, M. A., Welsh, H. H., Lennette, E. H., and Abinanti, F. R.: Q fever in California - VIII. An epidemic of Q fever in a small rural community in northern California.
- Coffey, J. H.: The control of flies in communities and on individual premises.
- Coffey, J. H., and Dunn, W. L.: The importance of sanitary refuse handling in fly control.
- Dodge, H. R.: The occurrence of certain palae-arctic species of muscoid diptera in the United States.
- Dodge, H. R.: Parasitism by sarcophagid flies.
- Donaldson, A. W.: Serological diagnosis of parasitic and mycotic infections.
- Eads, R. B., Menzies, G. C., and Ogden, L. J.: Distribution records of west Texas mosquitoes.
- Edwards, P. R.: The preparation of antisera for the detection of the somatic antigens of *Salmonella* cultures.
- Frobisher, M. F.: Laboratory procedures in the diagnosis of diphtheria.
- Gaines, T. B.: The failure of the rodenticide warfarin to injure Oriental rat fleas when the poison is fed to the host rat.
- Georg, L. K.: Medical mycology in Great Britain.
- Goldman, M., and Johnson, S.: Intestinal parasite survey in Atlanta, Georgia.
- Gordon, M. A.: The lipophilic mycoflora of the skin - I. *In vitro* culture of *Pityrosporum orbiculare* n. sp.
- Hansen, C. A.: Health as it relates to mosquito control.
- Howitt, B. F., and Nichols, V. J.: Inoculation of *Cynomolgus* monkeys with coxsackie virus alone, combined, or with poliomyelitis virus.
- Kissling, R. E., Rubin, H., Chamberlain, R. W., and Eidson, M. E.: Recovery of the virus of Eastern equine encephalomyelitis from the blood of a purple grackle.
- Lennette, E. H., Dean, B. H., Abinanti, F. R., Clark, W. H., Winn, J. F., and Holmes, M. A.: Q fever in California - V. Serologic survey of sheep, goats, and cattle in three epidemiologic categories, from several geographic areas.
- Mandel, E. E., and Popper, H.: Experimental medullary necrosis of the kidney - a morphologic and functional study.
- Menges, R. W., and Kintner, L. D.: Bovine histoplasmosis.
- Morlan, H. B., and Hines, V. D.: Evaluation of county-wide DDT dusting operations in murine typhus control (1950).
- Repass, R. P.: Unusual coloration of an *Aedes triseriatus* larva.
- Schoof, H. F., Siverly, R. E., and Coffey, J. H.: Dieldrin as a chemical control measure on community fly control programs.
- Smith, A. L.: A micro-slating device.
- Thurman, D. C., Jr., and Husbands, R. C.: Preliminary report on mosquito flight dispersal studies with radioisotopes in California, 1950.
- Tiffany, E. J.: Observations on internal organization and work loads in State public health laboratories.
- Washburn, G. E., Peters, R. F., and Thurman, D. C.: Operational investigations dealing with mosquitoes in California.
- Welsh, H. H., Lennette, E. H., Abinanti, F. R., and Winn, J. F.: Q fever in California - IV. Occurrence of *Coxiella burnetii* in the placenta of naturally-infected sheep.
- Winn, J. F., Lennette, E. H., and Abinanti, F. R.: Occurrence of *Coxiella burnetii* in the placenta of experimentally-infected sheep.

#### SOME CURRENT BOOKS RECENTLY ADDED TO THE LIBRARY

With the following books and other additions, the library's collection now totals approximately 9,450 volumes:



- American Academy of Political and Social Science: Medical care for Americans, 1951.
- American Public Health Association: Diagnostic procedures and reagents, 1950.
- American Public Works Association: Refuse disposal practice; a bibliography, 1948.
- American Public Works Association. Committee on Refuse Collection and Disposal: An analysis of sanitary fill operations, 1948.
- American Public Works Association. Committee on Refuse Collection and Disposal: Refuse collection and disposal practices, 1950.
- Annual review of medicine, v.1, 1950.
- Baur, H. L.: Urgent diagnosis without laboratory aid, 1950.
- Bell, E. T.: Experimental diabetes mellitus, 1948.
- Biggart, J. H.: Pathology of the nervous system, 1949.
- Boyd, William: Pathology of internal diseases, 1950.
- Brumpt, Emile: *Precis de parasitologie*, 1949.
- Building Officials Conference of America, Inc.: Abridged building code, 1950.
- Bulletin of the Atomic Scientists: . . . Civil defense against atomic attack, 1950.
- Cantarow, Abraham: Clinical biochemistry, 1950.
- Carnegie, Dale: How to stop worrying and start living, 1950.
- Condensed chemical dictionary, 1950.
- Dooher, M. J.: The supervisors management guide, 1949.
- Emmens, C. W.: Hormone assay, 1950.
- Fisher, W. S.: A revision of the North American species of beetles belonging to the family Bostrichidae, (U. S. Department of Agriculture. Miscellaneous publication, No. 698) 1950.
- Ginsburg, Ethel L.: Public health is people, 1950.
- Gunderson, N. O.: Study report on domestic grinders, 1948.
- Ham, T. H.: A syllabus on laboratory examinations in clinical diagnosis, 1950.
- Hewitt, L. F.: Oxidation reduction potentials in bacteriology and biochemistry, 1950.
- Hill, A. B.: Principles of medical statistics, 1949.
- International Congress on Industrial Medicine: Proceedings of the 9th . . . September 13-17, 1948.
- Jacobs, Katharine: List of serials currently received in the library of the U. S. Department of Agriculture, November 1, 1949, 1950.
- Joslyn, M. A.: Methods in food analysis, 1950.
- Kamen, M.D.: Radioactive tracers in biology, 1951.
- Kidd, J. G.: The pathogenesis and pathology of viral diseases, 1950.
- Kirk, Hamilton: Index of diagnosis (clinical and radiological) for the canine and feline surgeon, 1949.
- Kohls, G. M.: Ticks (Ixodoidea) of the Philippines (U. S. National Institute of Health Bulletin No. 192) 1950.
- Lee, A. B.: Lee's microtome's vade-mecum; a handbook of the methods of animal and plant microscopic technique, 1950.
- Lee, J. B.: How to hold an audience without a rope, 1947.
- McGee, L. C.: Student manual of industrial medicine, 1950.
- Manske, R. H. F.: The alkaloids, 1950, v. 1.
- Massey, Arthur (ed.): Modern trends in public health, 1949.
- Merchant, I. A.: Veterinary bacteriology and virology, 4th ed., 1950.
- Muir, Ernest: Manual of leprosy, 1948.
- New York State Legislature. Joint Committee to Study the Problem of Cerebral Palsy: Report, 1948.
- Nieburgs, H. E.: Hormones in clinical practice, 1950.
- Powell, J. H.: Bring out your dead, 1949.
- Roe, H. B.: Moisture requirements in agriculture, 1950.
- Ross, H. H.: How to collect and preserve insects. Illinois Natural History Survey Division. Circular No. 39, July 1949.
- Rossini, F. D.: Chemical thermodynamics, 1950.
- Sams, H. W.: Postwar audio amplifiers, 1948.
- Seckler-Hudson, Catheryn: Processes of organization and management, 1948.
- Shattuck, G. C.: Diseases of the tropics, 1951.
- Sodeman, W. A.: Pathologic physiology; mechanisms of disease, 1950.
- Straus, Robert: Medical care for seamen, 1950.
- Thomas, J. E.: External secretion of the pancreas, 1950.
- Thorne, D. W.: Irrigated soils, 1949.
- U. S. Army Medical Department: What you should know about the atomic bomb, 1948.
- U. S. Bureau of Animal Industry: Report of the Chief, 1949-50.
- U. S. Naval Dental School: Handbook for dental prosthetic technicians, 1950.
- U. S. Public Health Service. Bureau of State Services: Variations in State public health pro-



grams; analysis of information from the annual report and plan of State health departments, 1948-49.

U. S. Public Health Service. Division of Public

Health Methods: Medical groups in the United States, 1949.

Volker, Richard: Lehrbuch der Toxikologie für Tierärzte, 1950.

# AUDIO-VISUAL PRODUCTION SERVICES

## MAJOR PRODUCTIONS RELEASED DURING THE QUARTER

### Motion Pictures

4-116.0 Rural Rat Control. 16 mm., sound, black and white, 16 minutes, 572 ft.

M6 Municipal Sewage Treatment Processes. 16 mm., sound, black and white, 15 minutes, 475 ft.

M12 Analytical Balance, Basic Principles. 16 mm., sound, black and white, 19 minutes, 695 ft.

M37d Rodent Control Series: Practical Rat Control, Part I - Sanitation Techniques in Rat Control (Army-CDC Cooperative Project). 16 mm., sound, black and white, 21 minutes, 740 ft.

M37e Rodent Control Series: Practical Rat Control, Part II - Ratproofing (Army-CDC Cooperative Project). 16 mm., sound, black and white, 18 minutes, 640 ft.

M37f Rodent Control Series: Practical Rat Control, Part III - Rat Killing (Army-CDC Cooperative Project). 16 mm., sound, black and white, 37 minutes, 1,325 ft.

M39 Visual Report on Social Security in Brazil (for Social Security Administration, Bureau of Old-Age and Survivors Insurance). 16 mm., sound, color, 14½ minutes, 539 ft.

### Filmstrips

5-137.0 The Electrokymograph (for National Institutes of Health, National Heart Institute). 35 mm., sound, black and white, 9 minutes, 49 frames. Not available for distribution by CDC.

5-169.0 Isolation and Identification of *Salmonella* and *Shigella* Cultures, Part I - Isolation and Preliminary Identification of Cultures. 35 mm., sound, color, 13½ minutes, 85 frames.

5-171.0 Isolation and Identification of *Salmonella* and *Shigella* Cultures, Part III - Simplified Serologic Identification of *Salmonella* Cultures. 35 mm., sound, color, 6 minutes, 32 frames.

F12 Basic Principles of the Analytical Balance. 35 mm., sound, black and white, 13 minutes, 99 frames.

F21a Food Handling Series, Part I - Basic Principles of Refrigeration. 35 mm., sound, black and white, 14 minutes, 71 frames.

F21b Food Handling Series, Part II - Refrigerated Food Storage. 35 mm., sound, black and white, 12 minutes, 60 frames.

### 2- by 2-Inch Slide Series\*

S6a Municipal Sewage Treatment Processes - Secondary Sewage Treatment at Gainesville, Florida. Color, 40 slides.

S6b Municipal Sewage Treatment Processes - Primary Sewage Treatment at Gainesville, Florida, and Opelika, Alabama. Color, 40 slides.

S25(Sa) Sanitary Landfill Operations. Black and white, 31 slides, and color, 10 slides.

S26a Food Sanitation Series, Part I - Food Handling Practices. Black and white, 53 slides.

S26b Food Sanitation Series, Part II - Restaurant Equipment. Black and white, 96 slides.

\*The slides listed under this heading have limited availability.



- S38 Clinical and Laboratory Aspects of Medical Mycology. Color, 60 slides.
- S44a Water Treatment Installations. Color, 50 slides.
- S44b Water Treatment Installations – Several Locations. Color, 40 slides.
- S44c Water Treatment Installations – Manchester, Georgia. Color, 30 slides.
- S44d Water Treatment Installations – Opelika, Alabama. Color, 40 slides.
- S44e Water Treatment Installations – La-Grange, Georgia. Color, 50 slides.
- S44f Water Treatment Installations – Gainesville, Florida. Color, 20 slides.
- S44g Water Treatment Installations – Buena Vista, Georgia. Color, 12 slides.
- S63 Heart Disease Statistics. Color, 28 slides.
- S64 Bacteriological Chart for the Training of Sanitary Engineers. Color, 34 slides.
- S68 Construction of Septic Tanks. Color, 25 slides.
- S70 Historical Public Health Service Slides. Black and white, 154 slides.
- S71 Garbage and Refuse Disposal at Gainesville, Florida, and Cordele, Georgia. Color, 45 slides.

#### ADDITIONAL RELEASE PRINTS

In addition to all scheduled releases, the laboratory made 440 additional release prints of the filmstrip series "Taking Care of Diabetes" for the Chronic Disease Division; and 20 release prints each of the motion pictures "Epidemiology of Influenza," "Municipal Sewage Treatment," and "Sanitary Milk Production."

#### VERTICAL CAMERA MOUNT

The Vertical Camera Mount was designed for motion photomacrographic and photomicrographic work, using both the 16 mm. Maurer camera and the 35 mm. Mitchell motion picture camera.

Various special mounting bases were built to enable more full utilization of time-lapse unit and Zirconarc lamps.

#### DEPARTMENT OF STATE, DIVISION OF INTERNATIONAL HEALTH FILMS

For the purpose of planning a motion picture program as requested by the U. S. Department of State for use in connection with the President's Point Four and Economic Cooperation Administration programs, personnel were temporarily assigned to the Division of International Health.



The Vertical Camera Mount, adapted for motion photomacrographic and photomicrographic work, using the 16 mm. and the 35 mm. cameras interchangeably.

The purpose of this project was to survey the health problems of underdeveloped countries, and to work out a plan for films which could be produced for use in training to help solve the health problems. A survey was made for approximately 20 foreign countries. Emphasis was placed on health problems which are common to all countries concerned. However, some problems of special significance to specific countries were included, but with the expectation that highest production priority would be given to common problems.

The first phase of the program, which has been completed, resulted in recommendations of approximately 80 subjects on which production would be needed. These subjects were considered to represent the basic health problems. Many of the subjects can be treated with a single film while others may eventually require a series of films in order to provide appropriate coverage.

Production proposal outlines were prepared for each subject on which production was recommended. The following information was given for each subject: (1) subject, which might be used as a working title; (2) purpose, which stated the objectives to be reached by use of the film;



(3) audience level, which specified whether the film was being recommended for lay audiences or for technical and professional audiences; (4) essential basic concepts to be presented; (5) justification, which explains the relative significance of the health problem toward which the film is to be directed; and (6) comments relative to special emphasis to be placed on the film and in some cases establishing a priority.

Technical guidance was provided by the Division of International Health for all steps outlined in the production proposals.

The second phase of the project will be to develop treatment of the subjects selected and to activate actual production.

The third phase will be to evaluate existing films and formulate plans for adapting them for foreign use.

#### AUDIO-VISUAL TRAINING

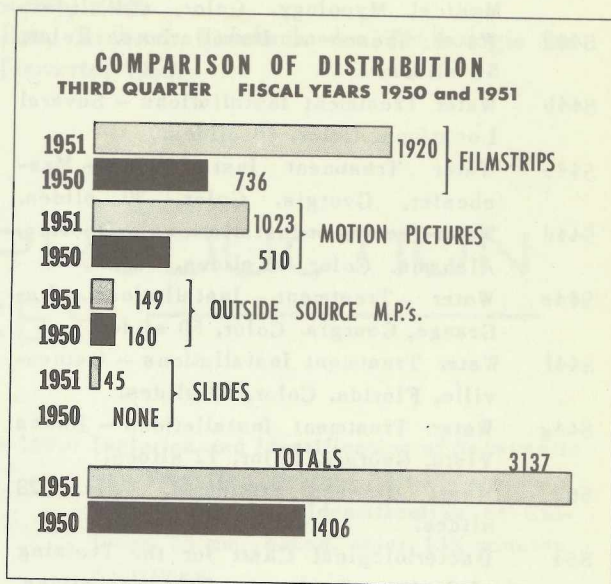
In addition to the above film planning, arrangements have been made for giving a short period of audio-visual training to all public health officers and to as many as possible of the civil service personnel who are being assigned to underdeveloped countries for Point Four and Economic Cooperation Administration programs. The purpose of this training is to familiarize these people with certain aspects of production, distribution, and utilization of training aids with which they will be concerned. Many persons have already received this training and 30 more were scheduled to receive training in May.

#### UTILIZATION PROGRAM

In the utilization program, chart 1 shows that distribution by the film library for the third quarter of fiscal year 1951 exceeds that for the corresponding quarter of fiscal year 1950 by 123 percent. It also exceeds that for the first and second quarters of fiscal year 1951 by 122 percent and 66 percent respectively.

The 1951 revisions of the Alphabetical and Classified Lists of CDC productions were mailed

Chart 1



to all catalog holders.

#### CLINICAL PATHOLOGY LABORATORY DISPLAY

The exhibits "Creeping Eruption," "Simple Blood Tests," and "Tuberculosis" were displayed at the open house of the Clinical Pathology Laboratory at Grady Memorial Hospital on January 22.

#### DISTRIBUTION STUDY

A study was made of distribution data to find the number of showings and audience for CDC productions since the beginning of the film library. These figures which include data from loans but none from films sold, are as follows:

Period	Showings	Audience
FY-1948 (9 months)	7,636	330,593
FY-1949	35,736	1,495,980
FY-1950	57,072	2,361,129
FY-1951 (Projected totals based on 9 months)	74,473	3,109,515
Totals to end of FY-1951	174,917	7,297,217



# ENGINEERING SERVICES

One organizational change was effected in the Engineering Services during the quarter – the transfer of the Maintenance Unit to the Administrative Services on March 22.

## **WATER RESOURCES DEVELOPMENT**

**Arkansas-White-Red River Basin Activities.** The present stage of progress and plans for CDC work in the Arkansas-White-Red River Basin was reviewed with Basin, Arkansas State Health Department, and CDC personnel in February. Considerable data have been assembled to date and work on the study is proceeding according to established schedule.

**Weber Basin Activities.** At the request of the Bureau of Reclamation, arrangements were made for initiation of a study on this water resources development project in cooperation with the Region IX CDC representative and the Utah State Health Department. The project report for this basin is scheduled for completion during the latter part of 1951. The work to be performed by CDC includes a mosquito survey which will be evaluated in terms of a prospective drainage program to be constructed by the Bureau of Reclamation. In addition, the study will include recommendations for additional drainage for mosquito control purposes.

## **MALARIA CONTROL ACTIVITIES**

**Malaria Surveillance and Prevention Program.** The Alabama and Florida State Health Departments each were assigned a nurse officer to complete consolidation of engineering, entomological, and epidemiological malaria surveillance prevention program plans.

In addition, a commissioned officer was assigned to the State CDC malaria program of Oklahoma. It is hoped that with this assignment, the scope of the program activities will be enlarged and the quality of ser-

vices rendered considerably improved.

**Defense-connected Activities.** In cooperation with Region VI, office personnel of the Malaria Section participated in insect vector reconnaissance surveys on four occasions in two military areas. Reports of these surveys have been included in the Regional Office consolidated reconnaissance survey reports.

**Military Malaria Control.** Pursuant to a formal request from the Antilles Department, U. S. Army, plans were approved to expand malaria control operations in the extra-reservation area of one additional military base in Puerto Pico.

**Calendar Year Summary of Activities.** Several of the residual spray program States do not complete seasonal operations until after the close of a fiscal year; therefore, in order to summarize program accomplishments and activities for a complete insect production season, a summary was prepared on a calendar year basis.



Pumping station built in Puerto Rico during early part of World War II for malaria control purposes. Station was required to provide outlet for natural drainage basin which was blocked by dredging operation.



**Table 1**  
**SUMMARY OF DDT RESIDUAL SPRAY OPERATIONS**  
**JANUARY 1 TO MARCH 31, 1951**

States	No. of Counties Operated	Total Spray Applications	Lb. DDT	Man-hours				Lb. DDT per Application	Man-hours per Application	Man-hours per Lb. DDT
				CDC	Local	% Local	Total			
Alabama	11	7,114	5,266*	6,274	2,908	31.7	9,182	0.740	1.291	1.744
Arkansas	-	-	-	560	4,538	89.0	5,098	-	-	-
Florida	-	-	-	-	-	-	-	-	-	-
Georgia	4	781	590	-	669	100.0	669	0.755	0.857	1.134
Kentucky	-	-	-	-	240	100.0	240	-	-	-
Louisiana	-	-	-	2,400	-	0.0	2,400	-	-	-
Mississippi	-	-	-	2,992	-	0.0	2,992	-	-	-
Missouri	-	-	-	-	-	0.0	-	-	-	-
North Carolina	-	-	-	-	-	0.0	-	-	-	-
Oklahoma	-	-	-	-	-	0.0	-	-	-	-
South Carolina	-	-	-	1,680	8,360	83.3	10,040	-	-	-
Tennessee	-	-	-	-	-	-	-	-	-	-
Texas	2	3,063	1,525	2,960	2,160	42.2	5,120	0.498	1.671	3.357
<b>Total</b>	<b>17</b>	<b>10,958</b>	<b>7,381</b>	<b>16,866</b>	<b>18,875</b>	<b>52.8</b>	<b>35,741</b>	<b>0.674</b>	<b>3.262</b>	<b>4.842</b>

\*590 lb. chlordan and 2,172 lb. resin-base DDT.

A summary of the third quarter fiscal year program accomplishments is presented in table 1.

#### **TYPHUS AND RODENT CONTROL ACTIVITIES** **MURINE TYPHUS CONTROL ACTIVITIES:**

The declining number of human cases of murine typhus fever, supplemented by data on typhus foci among domestic rats, indicates that the distribution of the disease once quite continuous has been broken up due to control measures. Only 683 cases were reported from the United States during 1950 as compared to 984 during the previous year and 5,338 during the peak year 1944. During the period January through March of this year, only 68 cases were tentatively reported as compared to 168 for the same period of 1950.

Intensive surveys are in progress to determine the effect of control measures in eliminating domestic rats and also in eliminating murine typhus where rats are still present. In Texas, where most cases occur in the eastern half of the State, control and survey units were set up in five of six State health districts. In two counties, an educational program was begun for high

school agricultural students. These students were instructed in all phases of antirrat work and were supplied with live rats for testing for presence of murine typhus fever.

Surveys completed between July 1, 1950, and March 5, 1951, reveal that 26 percent of the 271 rat-infested urban premises yielded rats with murine typhus fever antibodies and only 3 percent of 238 rural premises yielded positive rats. The problem is therefore generally more urban than rural in Texas. There are exceptions, however, and some of the counties bordering Louisiana appear to have extensive rural problems.

In Georgia, biological surveys made since July 1 for the purpose of guiding control operations in 41 counties reveal that during calendar year 1950 only 9.3 percent of the rats caught bore typhus antibodies. The percentage of premises with infected rats was similar. During 1946, before much DDT dusting and attendant antirrat work was done, 32 percent of the rats taken were found with typhus antibodies.

In the southern half of Georgia, Alabama, Mississippi, and Florida, much of the typhus problem is rural as well as urban in that



**Table 2**  
**TIME AND PERCENTAGE OF TOTAL WORK DEVOTED TO MURINE TYPHUS CONTROL**

	January 1 through March 31, 1951		July 1, 1950, through March 31, 1951	
	Man-hours	Percentage of Total Time	Man-hours	Percentage of Total Time
State and Local	121,353	80	335,070	79
Public Health Service	31,132	20	89,455	21
<b>Total</b>	<b>152,485</b>	<b>100</b>	<b>424,525</b>	<b>100</b>
	<b>Percentage of Total Time</b>		<b>Percentage of Total Time</b>	
State and District Supervision (PHS), Shop and Entomological Service	13		13	
State and Regional Supervision (State and Local)	7		6	
Public Health Service and State-Local Training and Educational	4		4	
Sanitation Activities	5		6	
Residual Dusting	7		13	
Evaluation Activities	13		8	
Ratproofing and Initial Eradication	16		19	
Maintenance of Ratproofing	2		2	
Rat Reduction	32		29	
Miscellaneous and Leave	1		0	
<b>Total</b>	<b>100</b>		<b>100</b>	
	<b>Training and Educational Activities</b>	<b>Ratproofing and Eradication</b>	<b>Training and Educational Activities</b>	<b>Ratproofing and Eradication</b>
No. Meetings Held	42		114	
No. Attending	558		2,559	
No. Persons On-the-Job Training	211		267	
Avg. No. Man-hours per Trainee	20		14	
Communities with Ratproofing Projects		17		29
Establishments Ratproofed		638		1,860
Communities with Poisoning Projects		85		85
Establishments Poisoned		112,661		279,148

rats with murine typhus antibodies are widespread.

In the more northern States affected by typhus, the problem is not so widespread, and accordingly it is possible to eradicate it easily in many wide areas there. In rural areas, the percentage was much lower than 8 percent but many of the cities showed a

higher percentage: 27 in Little Rock, Ark., and 11 in Eldorado, Ark. During the 1945-46 period, 8 percent of all the rats tested revealed the presence of murine typhus antibodies.

The time devoted to murine typhus control is shown in table 2.

Seventeen communities had ratproofing and



supporting harborage and garbage removal activities; they completed work in 638 establishments.

**Defense-connected Activities.** Personnel engaged in murine typhus control activities are conveniently located in relation to defense-connected areas, and keep informed concerning population growth of the area and of related rat-inviting construction and sanitation problems. They are available to any area in which rat-connected problems are anticipated or where they occur. Operating in the southeastern States where murine typhus fever and related diseases are widespread, they have continued to aid in suppressing the number of human typhus cases to a low level after having helped to reduce them gradually from the high level of 5,338 reported cases in 1944.

This activity affects any personnel who are employed, live, visit, or shop in grocery stores, theatres, restaurants, or rooms and apartments. It is carried on intensively around military establishments as well as defense-related industries.

#### **CITY RODENT CONTROL:**

Time devoted to rodent control is shown in table 3.

There were 357 premises ratproofed on 6 city projects. The ratproofing by private industry was due to inspections and recommendations by a group of newly-trained sanitarians. This makes 1,153 premises ratproofed for the fiscal year. There were 3,228 premises poisoned during the quarter and a total of 9,674 premises poisoned during the first three quarters of fiscal year 1951.

Local governments contributed 17,926 man-hours, 81 percent, of the time devoted to antiratsanitation during the quarter and 45,374, 82 percent, for the first three quarters of fiscal year 1951.

CDC, State, and local man-hours on rodent control activities for the fiscal year were 175,325. Of this figure, State and local services contributed 140,124 man-hours, or 80 percent of the total.

**Defense-connected Activities.** Rodent control personnel are assisting the State health departments with civil defense planning on insect and rodent control. The pro-

grams are being planned to improve the environment for man and are adaptable also for use in the event of any emergency which would affect civil defense.

Appropriate training courses were given to personnel from nine military establishments, and inspections for rodent infestation were made at other military establishments and defense industries. Suggestions and advice on the best methods to improve conditions and eliminate the rat and mice infestation were given as well as demonstrations on the use of rodenticides.

#### **FLY CONTROL ACTIVITIES**

Plans were made for the operational programs and for procuring equipment and supplies in preparation for the approaching fly breeding season at the projects of the Diarrhea and Dysentery and the Fly-Polio Investigational Programs. A continued effort is being made to compile and distribute educational-informational materials to the projects.

A Fly Control Packet containing sanitation-educational and information media has been compiled and will soon be available for use in community fly control programs. The following manuals and pamphlets are included in the packet:

1. Fly Control - Sanitation - Educational and Information Program.
2. The Control of Domestic Flies.
3. Environmental Sanitary Survey - Fly Control.
4. Pamphlets on Fly Control.
5. Suggested Press Releases for a Fly Control Sanitation Program.
6. Available Films and Slides.
7. Refuse Handling in Fly Control.
8. Instructions for Conducting Entomological Surveys and Evaluation.
9. Selected Bibliography of Fly Control.

It is expected that the information contained in this packet will serve the purpose of outlining a standard procedure for conducting fly control sanitation programs in communities.

The series of 14 throw-away pamphlets on sanitation and fly biology (listed in the packet) has been completed and sample copies are being reproduced. Three of these pamphlets were reproduced at the Phoenix project and were used in promoting spring clean-up



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Table 3

## TIME AND PERCENTAGE OF TOTAL WORK DEVOTED TO RODENT CONTROL IN CITIES

	January 1 through March 31, 1951		July 1, 1950, through March 31, 1951	
	Man-hours	Percentage of Total Time	Man-hours	Percentage of Total Time
State and Local Public Health Service	59,611	80	140,124	80
	14,831	20	35,201	20
<b>Total</b>	<b>74,442</b>	<b>100</b>	<b>175,325</b>	<b>100</b>
	Percentage of Total Time		Percentage of Total Time	
Supervision				
Public Health Service	5		5	
State-Local	3		3	
Evaluation				
Public Health Service	1		3	
State-Local	28		29	
Sanitation				
Public Health Service	5		6	
State-Local	24		26	
Surveys				
Public Health Service	1		1	
State-Local	2		1	
Training	5		4	
Education	9		5	
Ratproofing and Eradication	4		5	
DDT Dusting and Spraying	1		1	
Maintenance	1		—	
Poisoning	9		10	
Leave (CDC)	2		1	
<b>Total</b>	<b>100</b>		<b>100</b>	
	Training and Educational Activities		Training and Educational Activities	
No. Persons On-the-Job Training	205		234	
Average No. Man-hours per Trainee	17		26.5	
No. Meetings Held	176		225	
No. Attendance	2,474		3,557	

week.

Since the development of high "resistance" to DDT, chlordan, and dieldrin, the chemicals used in control operations during previous seasons, experimental quantities of

Allelcel 80 (synthetic pyrethrum), pyrethrum, lindane, Dilan, benzene hexachloride (BHC), paradichlorobenzene (PDB), p-dichlorodiphenyl methylcarbinol (DMC), and piperonyl butoxide have been procured for testing



at the Phoenix, Ariz., project in an effort to find an effective insecticide for that project. In recent small-scale field tests, BHC was found to be fairly effective as a larvicide.

Activities of the Topeka, Kans., fly control project, which has been continued by the Topeka-Shawnee County Health Department, included inspection of garbage storage facilities and red tagging inadequate containers, as well as initiation of the current season's sanitation-educational campaign with a series of articles in local newspapers. The high level of sanitation being maintained in the areas inspected clearly indicates the effectiveness of the past 2 years' work on this basic phase of fly control.

#### FLY-POLIO CONTROL PROJECTS:

Sanitation and educational activities were given increased emphasis at the Fly-Polio projects - especially at Phoenix. In conjunction with sanitation programs, "spring clean-up weeks," sponsored by the local health departments and interested civic groups, are being utilized to arouse civic pride to clean up the cities and keep them clean.

In February, personnel of the Charleston, W. Va., City Health Department and the local fly control project participated in a conference to outline an education-informational campaign for the approaching fly control season. Civic groups, church organizations, the newspapers, radio stations, and the local medical association will cooperate in promoting the objectives of the fly control program.

An analytical study of Charleston's existing refuse collection system was initiated in January in cooperation with the city sanitation department. Preliminary findings of the survey indicate that improved practices may lead to substantial savings through more efficient use of man-power and equipment.

At Phoenix, Ariz., a personal contact sanitation campaign in the substandard areas of the city has vastly improved the outlook for the environmental sanitation program. These door-to-door contacts, in addition to the garbage can drive which was held last fall, have raised the percentage

of approved garbage containers to 95 percent, even in the substandard areas. Also, over 150 fowl and animal pens were cleaned or eliminated, and more than 700 premises cleaned. Clean-up week began on March 26 as the first step in the development of this season's program for eliminating fly breeding sources. Several civic groups, as well as the city departments, are actively supporting the city-wide clean-up. Approximately 60,000 pamphlets aimed at sanitation improvement were distributed by the Boy Scouts on March 17.

#### DYSENTERY AND DIARRHEA-FLY CONTROL PROGRAMS:

At the projects of the Dysentery and Diarrhea-Fly Control Programs in Arizona, New Mexico, Texas, and Kentucky, activities were concentrated on objectives designed to improve the level of environmental sanitation. Sanitary surveys, which present a clearer picture of sanitation conditions from which an over-all plan for correcting these conditions can be formulated, have been completed at most project cities.

House-to-house calls, with follow-ups when necessary, have caused a marked improvement in garbage storage facilities at Yuma, Ariz.; 19 privies have been made flyproof or removed; several animal and fowl pens have been cleaned; and four new areas within the city limits have been provided with garbage service.

Radio spot announcements (English and Spanish), news items (English and Spanish), and a spring clean-up drive sponsored by the Junior Chamber of Commerce have highlighted the education-sanitational program in Yuma.

From field tests, there is some indication that the flies at Yuma are resistant to dieldrin even though this chemical had not previously been used on the project.

In Coolidge and Casa Grande, Ariz., block-by-block contact work has raised the level of environmental sanitation. The stockyards in Casa Grande have been moved 4 miles from the city limits. The education-sanitational program has featured talks to the pupils at both the grammar and high schools, the showing of films on fly biology and sanitation, theme contests in the schools on fly control, and photographic posters on fly control by the Casa Grande Camera Club.



At Carlsbad, N. Mex., films on sanitation and insects as disease vectors have been shown to more than 1,600 citizens in connection with talks on fly control. The privy survey, part of the program to eliminate as many privies as possible and to flyproof the remainder, is nearing completion. Many property owners have agreed to install modern plumbing.

A recent summary of sanitation improvements in Carlsbad since July 1, 1950, shows: 122 permits issued for sewer connections (not including new construction); 550 new garbage cans; a large increase in garbage wrapping; one new closed garbage truck purchased; an increase in collection crews; improved supervision of garbage collection; extension of the twice-weekly and once-weekly collection routes, acquisition of a new site for semisanitary landfill; and many improvements in special problem premises.

The accomplishments of the fly control projects in Texas have led to plans for the establishment of a new project at Alice, Tex., which will be operated on local funds with guidance from the State program.

Plans are being formulated to activate a continuous fly control school at the Seguin, Tex., project this season. All municipalities within the State will be invited to send representatives to the training course, which will be directed by the fly control supervisor with the assistance of a full-time sanitarian.

The projects at Seguin, Sinton, and Taft are progressing with their sanitation programs. For example, in Sinton, 88 privies were eliminated during this quarter. In addition, the last hog pen in the city was removed. At Seguin, the fly densities have remained at their early March levels while those of the check town have risen to six times that of early March. Spraying operations have been started on the Texas projects.

At Harlan, Ky., a sanitation survey with special reference to excreta disposal has been completed. A report of the findings, together with suggested solutions to correct the insanitary conditions arising from the improper disposal of human waste, has been presented to the city council.

The Harlan education-sanitational program

has progressed with the showing of three films on sanitation and vector control at the local high school in conjunction with talks on the same subjects; promotional talks to citizens while conducting the sanitation survey; and several newspaper articles.

### **IMPOUNDED WATER ACTIVITIES**

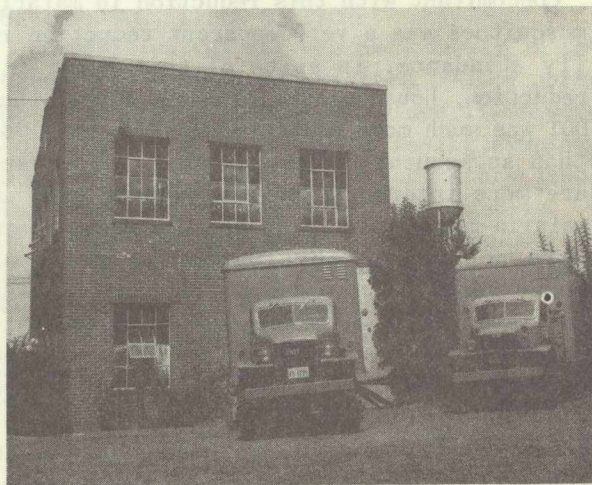
#### **CORPS OF ENGINEERS IMPOUNDMENTS:**

Mosquito control reports were submitted to the Corps of Engineers on two projects, Albeni Falls in Idaho and Greers Ferry in Arkansas. An unusual feature associated with the Albeni Falls project is a proposal by the Corps of Engineers to eliminate permanently a mosquito breeding source of a few acres in extent within the city of Sandpoint, Idaho. This low area, which has always been an important source for pest mosquitoes, would, according to the proposed plans, be eliminated by filling.

### **DISASTER AID ACTIVITIES**

During February a disruption of the water service to Columbia, Pa., was caused by clogging of the outlet from the raw water impounding reservoir. Assistance was offered the State sanitary engineer by telephone. It was particularly indicated that a 100 g.p.m. truck-mounted water purification unit, being transferred from Atlanta to Boston, could be made available.

The CDC representative in Region I was trained in the operation of the 100 g.p.m. truck-mounted water purification unit. Dis-



Water purification units provide emergency water supply for town where plant filters were inoperative for 2 weeks.



aster aid equipment delivered to Boston, Mass., included the following:

- 1 - 100 g.p.m. truck-mounted water purification unit
- 1 - ¼-ton trailer for the above
- 1 - ¾-ton Dodge power wagon
- 2 - 3,000 gal. rubberized fabric tanks
- 5 - 1,000 gal. glass fabric tanks

These are stored in a municipally owned road equipment warehouse at Newton, Mass.

#### PROPOSED BUILDING FOR CDC

Conferences were held with the contract architect and Service Chiefs during the development of the tentative plans, the third phase of design.

About March 1, the contract architect submitted the tentative plans to Public Buildings Service and furnished five sets to CDC. On March 14, the tentative plans after minor changes were made, were approved by the chairman of the CDC committee. An approved copy was forwarded to PBS on March 14.

## ENTOMOLOGIC SERVICES

#### RESIDUAL SPRAY PROGRAM

As mentioned in previous reports,\* the benefits derived from the Residual Spray Program (Malaria Eradication Program) are by no means confined to malaria control. Many other insects, primarily house flies, cockroaches, and bedbugs, are reduced by residual DDT deposits. During the 1950 season, more than 12,000 house inspections were made and entomological evaluations indicated that 99.4 percent of the sprayed houses were being maintained free of *Anopheles* mosquitoes.

Concomitant with this reduction in malaria mosquitoes was a very apparent reduction in fly abundance. In spite of this house fly reduction, householders commonly report that DDT was much more effective in 1945 and 1946 than subsequently. Many people, of course, are more interested in fly control than in malaria mosquito control because results are more noticeable. Evaluation of residual spray results in terms of fly control was initiated in 1948. Since that time approximately 30,000 inspections of both sprayed and unsprayed houses have been made. These data show definitely that a significant degree of fly control has been achieved in the sprayed houses. In each of the 3 years, a far greater percentage of sprayed houses

fell within the lower fly density groups (0 flies and 1-10 flies) as compared with unsprayed houses. In addition, twice as many sprayed houses, on the average, had no flies at all as compared to the unsprayed houses. This is not to be interpreted as meaning that adequate or satisfactory fly control is being obtained on the Residual Spray Program. We would like to have an insecticide which would place the 3-year average of houses in the "0 flies" category much closer to 100 percent than the present average of only 17 percent. These results clearly indicate the need for adequate environmental sanitation if we are to go much further in fly control.

#### MALARIA INVESTIGATIONS

HELENA, ARK., FIELD STATION:

**Epidemiological Work.** Severe winter weather and annual changes in the place of residence of the human population, as well as in the numbers, drastically curtailed routine visits in the study area. Changes involved about 55 percent of houses and 62 percent of the population. A total of 81 blood smears was taken, mainly of new residents; five slides from malaria suspects were received from doctors. The latter were all negative. It is believed that physicians now submit blood smears primarily to rule out malaria when fevers of unknown origin or confusing

\*CDC Bulletin X(3):13, March 1951.



symptomatology exist.

**Biological Work.** Freezing temperatures and generally severe winter conditions were quite unfavorable for the survival of adult anophelines. Adult stations both inside the intensive study area and outside this area gave a total count of 133 *Anopheles quadrimaculatus*, 17 *A. punctipennis*, and no *A. crucians* females. The majority of these hibernating females were found in privies, and a few were located under houses. Standard-type red boxes, and human habitations were completely devoid of anophelines, while animal quarters yielded only three specimens of *A. quadrimaculatus* during the quarter. Immature forms were practically nonexistent; of a total of 350 dips made, 0.02 anopheline larvae were taken per dip; the six larvae taken were all crucians. This is of interest since no hibernating adults of this species were seen.

**Insectary Work.** The colonized strain of *A. quadrimaculatus* (NIH strain) is being maintained without difficulty. In connection with the egg desiccation studies, to provide eggs of a type that could withstand drying, a colony of *Aedes aegypti* was established from eggs obtained from the Newton, Ga., station, but did not prove to be as prolific and vigorous as desired. Consequently, a new colony was established from eggs supplied by the NIH laboratories, and the Newton strain will be discontinued. The *aegypti* larvae are being reared exclusively on rabbit food pellets. The colony of *Culex quinquefasciatus* was discontinued, since need for this species (to provide teaching material for laboratory personnel) had been fulfilled.

In response to a request from the Virus and Rickettsia Laboratory, Montgomery, Ala., light trap collections of *Culiseta inornata* are being made; females, brought to the field laboratory, are given a human blood meal and egg rafts are sent, via air mail, to the laboratory, Montgomery. This mosquito species has been implicated as a natural host of encephalitis virus.

**Experimental Work.** Preliminary studies on the possible effect of different types of blood on egg production in *A. quadrimaculatus* were continued. The colonized strain of *quadrimaculatus* was fed on human, chicken,

and rabbit blood, and 15 fully engorged females from each of the above hosts were isolated and treated in the manner described for biotic potential studies.\* Only one oviposition was allowed each female and the larval hatch was recorded at 24-hour intervals from the oviposition date; the survival in tap water during a 24-hour period was also noted. No analysis can be made yet on the available data.

Preliminary to proposed studies of possible differences between delta, rice-field, and laboratory strains of *A. quadrimaculatus*, experiments were initiated on the viability of *quadrimaculatus* eggs subjected to desiccation on spontaneously-drying rice-field-type soil. Gravid females were allowed to oviposit on water over soil in small aluminum funnels. The material was handled in a manner designed to prevent completely any manipulation of the eggs. All funnels containing eggs on saturated soil were allowed to dry spontaneously and certain of these were flooded at 24-hour intervals subsequent to the start of desiccation; counts of eggs were made and the percentage hatching computed on a 24-hour basis. Preliminary data suggest that most of the NIH strain of *quadrimaculatus* eggs were killed at between the fifth and sixth days after onset of desiccation. Control *quadrimaculatus* eggs gave between 75 percent and 80 percent hatch; control *A. aegypti* eggs, flooded at the termination of the experiment, gave a 75 percent hatch.

#### NEWTON, GA., FIELD STATION:

**Epidemiological Survey.** Each family in the experimental area was visited by the nurse at least once a month, and blood films were collected from 20 residents having symptoms suggestive of malaria. All laboratory findings reported to date have been negative.

**Anopheline Abundance.** Weekly counts of adult *Anopheles* and collections of larvae were made at six established breeding areas in the experimental area. The unusual drought conditions have continued, and an unusually cold winter resulted in small, irregular collections of *A. quadrimaculatus* and *A. crucians*. *A. punctipennis* larvae and adults were found only in small numbers

\*Bellamy, R. E.: CDC Bulletin IX(1): 22-25, January 1950.



throughout the quarter.

**Mosquito Biological Work.** The fertility of overwintering *Anopheles* was investigated during the colder part of the quarter. Female *A. quadrimaculatus*, *A. punctipennis*, and *A. perplexens* were collected by the fumigation of hollow trees, as well as from natural resting places. Fertility was determined by the dissection of the spermatheca, and the demonstration of active spermatozoa. Some 76 percent of the *A. quadrimaculatus* and 78 percent of *A. punctipennis* were thus found to be fertile, presumably from matings which must have occurred before the onset of cold weather in late November, since males of these species had not been observed since that time.

Efforts to colonize local *Anopheles* were curtailed since adults of these species were not available.

As part of the ecological appraisal of *A. quadrimaculatus* habitats and food sources, studies of plankton algae are being conducted, and it is planned to make a qualitative and a quantitative study of the algae for 1 year. To date, a total of 357 species of algae has been found, representing 91 genera.

**Parasitological Work.** A strain of *Plasmodium relictum* is being maintained in English sparrows by direct blood inoculation, so as to determine the effects of this type of transmission on gametocyte production and infection rates of normally susceptible mosquitoes. This study is designed to provide information on possible alterations of experimental malaria infections that could be effected by maintenance methods usually employed in laboratories. It is planned to maintain parasites in a "natural" host and to effect transmission with mosquitoes as well as through direct blood transfers, and to ascertain if any difference is evidenced because of the different methods employed. To date the infection has been passed to 15 birds without significant changes in either the proportion of gametocytes or the rate at which *C. quinquefasciatus* mosquitoes are infected. Approximately 90 percent of the mosquitoes of this species fed throughout the study have become infective.

To determine if plasmodia develop any degree of host specificity, some observa-

tions were made of the mosquito transmission of *P. relictum* between species of birds. Using *C. quinquefasciatus* as a vector, this parasite was transmitted successfully from an English sparrow to a canary and then back to another English sparrow; twice from an English sparrow to a vesper sparrow; and once each from an English sparrow to a white-throated sparrow, and from an English sparrow to a cardinal.

As part of a survey of avian blood parasites in the area, blood films were made on an additional 112 birds, representing 22 species; 28 were positive for *Plasmodium*, 3 had double infections, while 3 specimens contained *Haemoproteus* infections.

MANNING, S. C., FIELD STATION:

**Epidemiological Survey.** Of the 1,900 people now living in the intensive study area, an average of 85 percent furnished blood films each month during the quarter. As in past years, a semiannual survey of the marginal area was conducted the latter part of March. Eighty-six percent of the population of 1,100 in this area was sampled. Recent reports from the laboratory pertain to 5,926 slides submitted in September, October, and November 1950; these were all negative. Known positive malaria slides inserted at the rate of five or six per month among the survey films to test accuracy of the technicians were diagnosed satisfactorily.

**Biological Studies.** No adults of *A. quadrimaculatus* or *A. crucians* were observed this January or February at 10 selected stations. In March, both of these mosquitoes appeared in very small numbers. *A. punctipennis* was noted early in February, and a few were recorded in March.

The collection of hibernating mosquitoes by the fumigation of hollow trees with sulphur dioxide was terminated for the 1950-51 season. A total of 57 hollow trees was fumigated from December to February. These yielded 15 *A. quadrimaculatus*, 6 *A. punctipennis*, 122 *Uranotaenia sapphirina*, and 19 *Culex (Melanoconion)* sp. There seemed to be no preference by mosquitoes for any particular species of trees among the nine identified kinds. Those in which hollows were most commonly found were sweet gum, water oak, and white oak. The average size of the openings of hollows in which anophelines



were found was twice that of those where the other mosquitoes were located. Only females of any species were recovered and, with the exception of *U. sapphirina*, no more than five individuals were found in one tree. As many as 48 *U. sapphirina* were counted in a single hollow.

Weekly checks of anopheline larvae populations have been continued during this quarter at four ponds. Although considerable variation between ponds has been evident, none have produced large numbers. *A. crucians* larvae alone were found throughout the winter in the ponds under surveillance. From one of these bodies of water, larvae of *A. quadrimaculatus* were observed on March 12.

**Parasitological Studies.** During March, the collection of anophelines for dissection this season was begun. Totals of 95 *A. crucians*, 6 *A. quadrimaculatus*, and 3 *A. punctipennis* were examined. Practically all that were observed at the 32 collecting stations were brought into the laboratory and dissected, and none were found positive for sporozoites or oocysts.

In addition to maintaining the Manning laboratory strain of *P. relictum* in canaries, sparrows are being examined to obtain another virulent strain of this parasite. *C. quinquefasciatus* are infected with *P. relictum* and then utilized to check techniques employed in handling positive wild-caught anophelines. These procedures are constantly scrutinized so that improvements may be effected where necessary.

A special type of glass tissue grinder has been secured for comminuting infected mosquitoes as well as tissues. With this device, it is easy to obtain suspensions that can be injected through hypodermic needles of approximately No. 27 gage. This is far better than the results found with other instruments tried in this laboratory.

For nearly 1 year, a number of mature chickens naturally infected with *Leucocytozoon andrewsi* has been under observation. Weekly blood films for several months have been examined from four of the birds. By means of the high dry objective of the microscope, the number of the parasites detected in a period of 5 minutes is counted. This method has long been used in other laboratories with different parasites. While some

fluctuations in the counts have been noted, keeping the infected chickens in a lighted coop at night does not at once appear to have had any major effect. Neither does the onset of egg laying seem to influence significantly the numbers of *L. andrewsi* in the peripheral blood.

Exflagellation of *L. andrewsi* has been observed. Fresh blood films in moist chambers were held for various intervals in the refrigerator before being stained and examined. On slides left 2 hours under these conditions, exflagellation of male gametocytes was evident. These sexual forms were the same characteristic round shape which is the only type of *L. andrewsi* ever recorded. Exflagellation is mentioned here since it is proof of maturity in the parasite. Although there have been no heavily infected chickens available for transmission studies, attempts to transmit the infection have been made employing the light natural infections at hand. Results were negative in efforts to bring about transfers with *C. quinquefasciatus* of the laboratory colony or with *A. quadrimaculatus* (Q-1 strain) from an NIH colony at Columbia, S. C. Field work this season may give some information on the subject. Particular attention is being devoted to young domestic chicks under natural conditions.

For the study of sporozoites of the genus *Haemoproteus*, it is planned to establish a colony of the known vector, *Pseudolynchia*. Some infected pigeons were obtained for this purpose.

The survey of blood parasites in wild animals included an additional 13 reptiles and 6 mammals this quarter. Five of the latter were gray squirrels. No *Plasmodium* has been observed in any wild animal to date.

To provide more permanent records of unknown sporozoites from wild-caught anophelines, many photomicrographs of reference slides have been taken. It has been found that these stained organisms deteriorate rather rapidly. Pictures were made also of gametocytes of *L. andrewsi* and of exflagellating forms of this parasite.

#### ECTOPARASITE INVESTIGATIONS

**Murine Typhus Activities.** A total of 5,139



rats collected during this quarter had been recorded at the time of this report, the collections being made in 13 Southern States and, in addition, in Ohio and Hawaii (table 1). This is the highest number of rats reported for a single quarter since 1948. The greatest number of rats was taken in the States of Texas and Alabama, in each of which more than 1,000 rats were collected. In each of these States, as well as in Arkansas where a very large number of rats also was examined, special surveys are in progress to determine the distribution of typhus in rats. Many of the records from Texas provided data on typhus infection in rats only, without any ectoparasite data. This is due to the fact that an interesting project is under way there, whereby a short course in rat control is given to high school boys, who in turn trap and bring in live rats for bleeding and testing.

In addition to the data received for the first quarter of 1951, there was obtained during this quarter a complete set of records on the rat-typhus survey of the District of Columbia, conducted during 1946 and extending into 1947. In this survey a

total of 656 rats was caught, and 5 percent of those examined showed the presence of typhus antibodies.

Data on 2,179 rats which had been caught and examined during the period October to December 1950, have now been analyzed. Successful complement fixation tests were reported on a total of 1,985 rats from this lot, 1,260 of which were collected in 10 percent DDT dust projects. It was not possible to compare results of the two strengths of DDT dust used, since insufficient numbers of rats were collected from premises dusted less than 18 months previously with 5 percent DDT dust. However, in the sufficiently large series of rats from premises dusted with 5 percent DDT dust more than 1½ years previous to trapping, a high incidence (22 percent) of typhus antibodies was found. No rats positive for typhus were taken from the survey projects in Illinois, Kentucky, and Oklahoma.

Analysis of these data by months showed a higher-than-usual percentage of rats from undusted premises in November and December that had typhus antibodies (22 percent and 27.5 percent respectively, or 28 percent and

Table 1  
RECORD OF RODENT EXAMINATION DATA  
FOR JANUARY 1 TO MARCH 31, 1951, AS RECEIVED THROUGH APRIL 19, 1951

State	Type of Project	Undusted				Dusted				Total No. Rat Tag Numbers Reported
		No. Rats Examined for Ecto-parasites	No. with <i>Xenopsylla cheopis</i>	No. Rat Serums Tested	No. of Serums Positive	No. Rats Examined for Ecto-parasites	No. with <i>Xenopsylla cheopis</i>	No. Rat Serums Tested	No. of Serums Positive	
Alabama	10% and 5% Dust	593	51	570	143	496	19	482	85	1,086
Arkansas	Survey	600	8	487	14	-	-	-	-	645
Florida	10% Dust	17	2	17	1	241	30	220	5	312
Georgia	10%, 5%, and Survey	82	11	84	15	479	4	456	43	583
Hawaii	10% Dust	13	0	13	1	6	0	6	0	19
Kentucky	Survey	11	0	11	0	-	-	-	-	17
Louisiana	10% Dust	48	12	45	15	48	20	41	12	95
Mississippi	10% Dust	76	3	72	0	38	0	37	0	112
North Carolina	10% Dust and Survey	102	3	101	3	177	0	170	3	708
Ohio	Survey	13	4	-	-	-	-	-	-	14
Oklahoma	Survey	104	0	100	0	-	-	-	-	115
South Carolina	10% Dust and Survey	35	0	64	1	36	0	62	0	208
Tennessee	10% Dust and Survey	-	-	-	-	-	-	-	-	31
Texas	10% Dust and Survey	366	17	594	61	396	37	355	54	1,118
Virginia	10% Dust	89	0	85	3	-	-	-	-	76
<b>Total</b>		2,149	111	2,243	257	1,917	110	1,829	202	5,139
Eight Southern States*	Total	1,284	99	1,483	239	1,838	110	1,761	202	4,045
	Percent Positive	-	7.7	-	16.1	-	6.0	-	11.5	-

\*Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, Tennessee, and Texas



32 percent respectively if only the Southern States are considered). The highest percentages of rats from undusted premises which were positive for typhus came from Alabama and Texas, where large-scale surveys to locate foci of typhus infection in rats are now in progress. A very satisfactory reduction of 70 percent in the percentage of rat serums positive for typhus during the first year after DDT dusting was obtained in nine Southern States (table 2); in rats from premises dusted more than 1 year previously, the reduction was 43 percent.

Data on the abundance of the Oriental rat flea (*Xenopsylla cheopis*) and its control by DDT dusting show that on 10 percent DDT dust projects very good reduction in the percentage of rats infested, and in average number per rat examined, was obtained and maintained through all periods after dusting, but that the average number per infested rat was only slightly reduced. On 5 percent DDT dust projects, rats from premises dusted more than 1 year previously showed a high percentage of infestation, and an average per rat examined of 0.7 as compared to 0.3 for comparable periods of 10 percent DDT dust projects. Both the percentage of rats infested, and the average number of *X. cheopis* per rat, from undusted premises were high during October, but were greatly reduced in November and December.

Analysis of data by States on the abundance of *X. cheopis* shows high rates from Texas, Florida, and Louisiana on undusted rats, and an unexpectedly high rate on a small number of rats trapped in Illinois. In all States in which DDT dusting programs were in operation, these control measures reduced the average number of *X. cheopis* per rat to satisfactory levels.

Several aspects of the incidence of typhus fever infection in rats have been studied during the quarter. One of the most significant of these is the long-term cycle of the incidence of typhus fever antibodies in rats, and its reduction by DDT dusting.

Complete data are available on this subject by months and quarters from October 1945 through December 1950, and incomplete results are available for the quarter January - March 1951. As is shown in figure 1, the percentage of rats found positive for typhus from undusted premises in eight Southern State (Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, Tennessee, and Texas) dropped each year from a high of 56 percent in the fourth quarter of calendar year 1945, to the very low average of 14.5 percent for the year 1949. This drop ap-

Table 2

INCIDENCE OF TYPHUS ANTIBODIES IN RATS  
IN NINE SOUTHERN STATES  
OCTOBER 1 TO DECEMBER 31, 1950

Data	Percentage of Rat Serums Positive for Typhus				Percentage of Reduction (Compared to Undusted)			
	Oct.	Nov.	Dec.	Total	Oct.	Nov.	Dec.	Total
Undusted	17.8*	27.7	32.0	27.8	-	-	-	-
Dusted 31-365 days	3.8	8.0	10.0	8.4	79	71	69	70
Dusted 366+ days	14.8*	15.9	15.9	15.8	17*	43	50	43

\*Less than 100 rat serums tested.

peared to continue through the first 6 months of 1950, because the data received for these two quarters showed an average percentage positive of only 12 percent. In the third quarter of 1950, a much higher percentage of positives (27 percent) was recorded. At first this figure was thought to be out of line and due to some aberrant factor, such as the possibility that large numbers of rats had been taken from selected typhus foci. No such factor was discovered, however, and when the data for the fourth quarter of 1950 showed a still higher percentage of serums positive for typhus (31.5 percent), the possibility of a definite upswing in the cycle of typhus in rats had to be considered. Incomplete reports for the first quarter of 1951 appear, at this time, to indicate that the percentage positive during the second quarter of 1951 will drop to about 16 percent, or close to the average



for the period 1948 through June 1950.

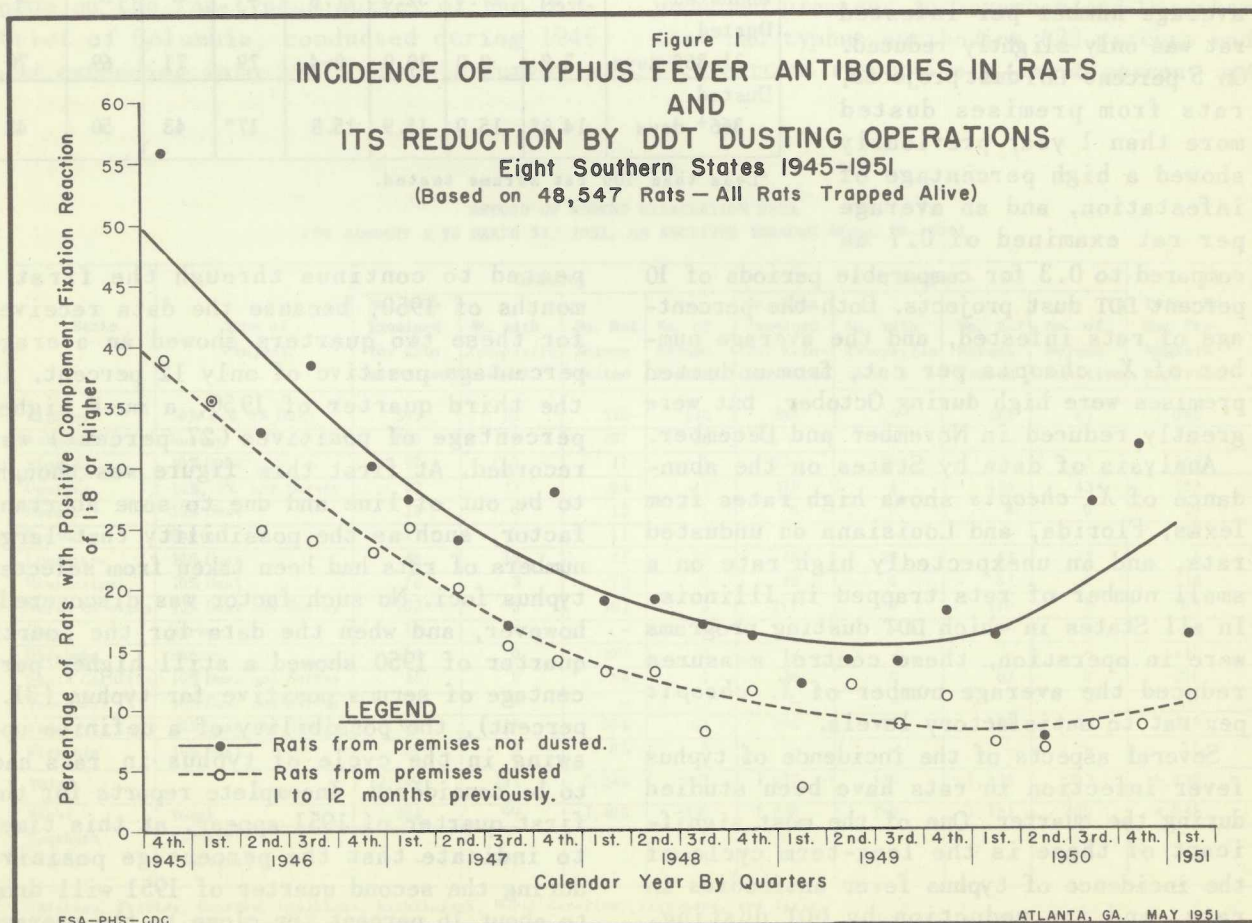
Also indicated in figure 1 is the amount of reduction of typhus in rats through DDT dusting operations. It is significant that the percentage of typhus-positive rats from dusted premises was uniformly lower than that from undusted premises, although this reduction was not as striking as that in the abundance of *X. cheopis*. Of greater significance is the fact that the percentage of reduction increased each year from 1946 through 1950, the average percentage reduction for each of these years being 21, 23, 37, 40, and 65, respectively. No increase in typhus in rats from dusted premises was indicated during 1950, the average for that year (7 percent) being the lowest for any year.

# **ENCEPHALITIS INVESTIGATIONS (In cooperation with Hooper Foundation, University of California)**

Entomological Studies. Between January 9

and February 22 a winter mosquito survey was conducted in the San Joaquin Valley portion of Kern County, Calif. The purpose was to increase knowledge of the wintering habits of mosquitoes, to supplement data obtained by regular weekly adult collections in fixed stations, and to increase the number of adult mosquitoes available for virus tests.

From a total of 105 adult shelters and 388 potential larval sources examined, 104 shelters and 51 collections of water contained mosquitoes. *C. quinquefasciatus* was the most abundant mosquito present during the period of the survey as a whole, both as adults and as larvae, although *Culex tarsalis* adults were constantly present in shelters and, toward the end of the survey, became more abundant than *C. quinquefasciatus*. It was not until the middle of February that early stage larvae of *C. tarsalis* were found in relatively large numbers. It was observed that *C. tarsalis* displayed a





positive increase in feeding activity around the middle of January; therefore there was a lag of about 3 weeks between the observation of engorged females and early stage larvae. This indicates that in this region most *C. tarsalis* females pass the late fall and early winter in a quiescent state hidden in well-protected places and that they become active again, feeding and depositing eggs, before warm weather sets in.

A total of 2,295 mosquitoes was collected and frozen during the quarter for subsequent testing for the presence of encephalitic viruses. Results of the tests will be reported later. As an indication of the frequency of occurrence of the various species collected this early in the year, the following is of interest:

Species	Number collected
<i>Culex quinquefasciatus</i>	1,328
<i>Culex tarsalis</i>	910
<i>Culiseta inornata</i>	26
<i>Anopheles franciscanus</i>	23
<i>Anopheles freeborni</i>	7
<i>Culiseta incidens</i>	1

#### Calculation of Vector Infection Rates.

Preliminary studies on the use of variable pool size to determine infection rates in *C. tarsalis* have been conducted. Although a complete analysis of results obtained cannot be given as yet, a summary of results to date is presented in table 3, which includes a total of 6,513 mosquitoes.

#### FLY-POLIO INVESTIGATIONS

**Polionyelitis Investigations - Fly Control Program.** Fly breeding studies and grill surveys conducted during the winter period at the Phoenix, Ariz., project revealed that winter fly activity is more widespread in the city than had previously been assumed. In the periodic examination of selected blocks, 53 percent of the inspections in the better class residential area were positive for the occurrence of larvae as compared to 60 percent in the substandard residential zones and 47 percent for the business section. In addition, eggs, puparia, and emerging adults were noted frequently on these

Table 3

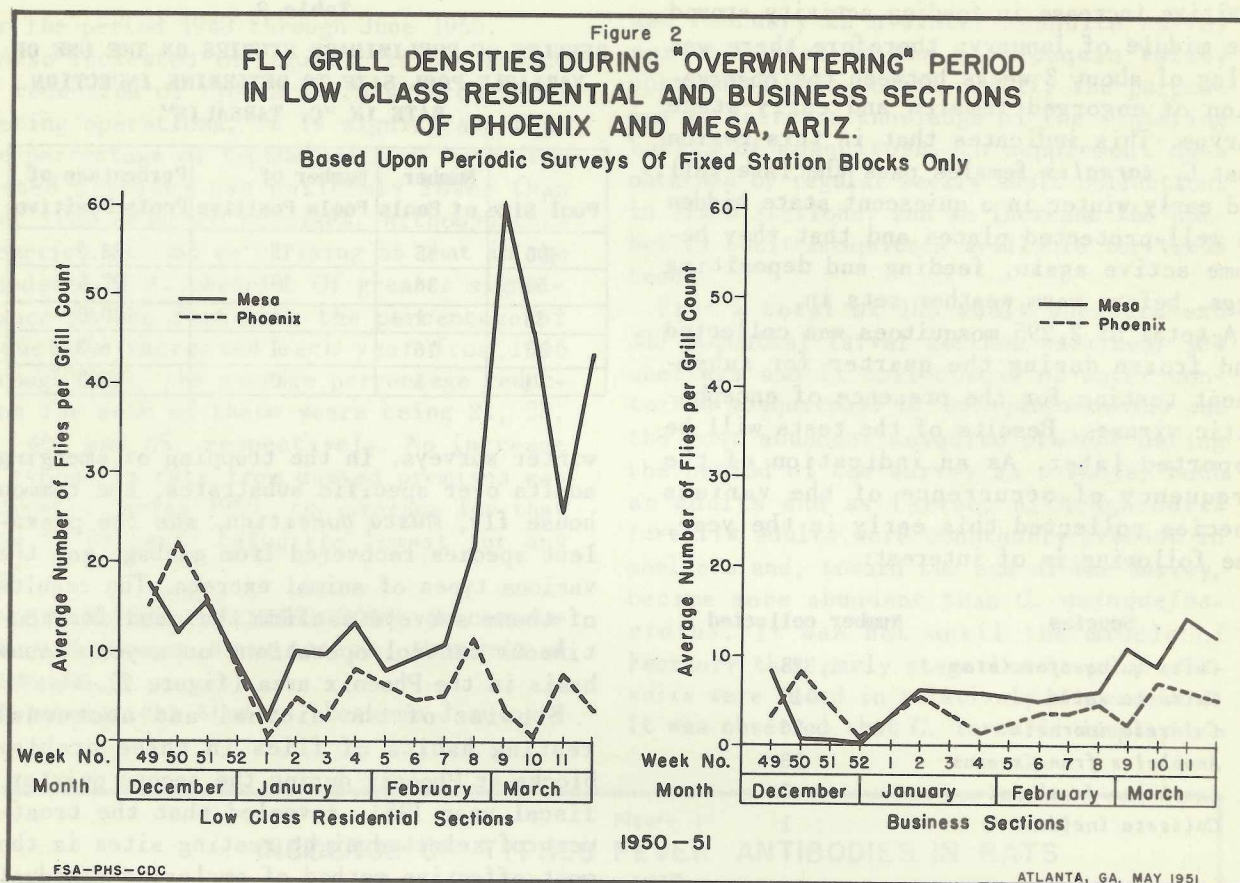
#### RESULTS OF PRELIMINARY STUDIES ON THE USE OF VARIABLE POOL SIZE TO DETERMINE INFECTION RATE IN "*C. TARSALIS*"

Pool Size	Number of Pools	Number of Pools Positive	Percentage of Pools Positive
100	45	15	33.3
50	36	10	27.8
38	1	1	100.0
10	16	1	6.3
1	5	0	0.0

winter surveys. In the trapping of emerging adults over specific substrates, the common house fly, *Musca domestica*, was the prevalent species recovered from garbage and the various types of animal excreta. The results of these surveys confirm the need for continuous control operations on a year-round basis in the Phoenix area (figure 2).

Studies of the diurnal and nocturnal resting habits of flies in three problem blocks at Phoenix during the second quarter, fiscal year 1951, revealed that the treatment of selected night resting sites is the most effective method of employing residual sprays. Tables 4 and 5 illustrate this, and show conditions prevailing in a representative residential block and a commercial food market. The tables show that at the time of the year these studies were conducted, cool night temperatures forced the majority of flies to rest inside shelters during the night. During the day the flies were dispersed over the study areas, and the proximity of the resting surfaces to feeding or breeding sites apparently is a more important factor than the specific type of surface involved. Treatment of small cylindrical surfaces, ceilings, and nearby shrubs at a dump station with an 8 percent DDT emulsion yielded effective control for approximately 12 weeks. This station was located ½ mile outside the control area in which fly resistance to DDT and dieldrin has been encountered. The toxicity of DDT to a fly population within such a short flight of one which showed resistance through 1950 is evidence that resistance does not always spread rapidly into surrounding areas, particularly when population pressures are





greater at the nonresistant sites. Therefore the ineffectiveness of a chemical at one location does not necessarily mean that it cannot provide effective control at other sites within the general area.

Results of fall breeding surveys at the Charleston, W. Va., project indicate that despite the high degree of fly control attained during 1950, fly breeding of one type or another was occurring in from 75 to 97 percent of the blocks inspected. Omission of data for larval infested dog stools does not materially affect this high rate of infestation. One substandard block in an October survey contained nine different types of positive breeding substrates, and 77 potential breeding media, of which 48 percent were infested.

Special studies were conducted at the Topeka, Kans.; Charleston, W. Va.; and Phoenix, Ariz., projects in 1950 to determine the comparability and relative values of adult fly density measurements obtained

by the Scudder 36-in. square grill, an experimental 18-in. square grill, and the reconnaissance (or visual survey) method of surveillance. Results indicate that, with the experienced grill inspectors used in these tests, the reconnaissance method yielded fly densities comparable to those obtained with the Scudder grill. In areas with low densities of 1 to 5 flies per grill count, the average densities by visual observations and by grill surveys were 2.8 and 3.3 respectively; in areas with densities of 5 to 25 flies per grill count, 11.3 and 14.5; in an area with densities of 25 to 50 flies per grill count, 22.5 and 38.8; and in an area with densities of 50 to 100 flies per grill count, 90.9 and 106.4. As the fly densities increased, the general tendency of the inspector on reconnaissance surveys was to underestimate the number of flies present. Since the measurement of fly densities on the reconnaissance survey is based upon an "estimated grill count" at



Table 4

SPECIFIC TYPE OF SURFACES UPON WHICH FLIES  
REST DURING DIURNAL AND NOCTURNAL PERIODS IN A  
MIDDLE CLASS RESIDENTIAL BLOCK, PHOENIX, ARIZ.,  
OCTOBER AND NOVEMBER, 1950

Type Surface	Morning		Afternoon		Night	
	No.	%	No.	%	No.	%
Trees and Shrubs	297	12.9	410	15.9	65	3.2
Ceilings	37	1.6	24	0.9	1,662	82.7
Cylindrical Surfaces ( $\frac{1}{2}$ in. or less)	123	5.3	107	4.2	229	11.4
Other	1,849	80.2	2,033	79.0	52	2.7
<b>Total</b>	<b>2,306</b>	<b>100.0</b>	<b>2,574</b>	<b>100.0</b>	<b>2,008</b>	<b>100.0</b>

Table 5

SPECIFIC TYPE OF SURFACES UPON WHICH FLIES  
REST DURING DIURNAL AND NOCTURNAL PERIODS  
AT A COMMERCIAL FOOD MARKET, PHOENIX, ARIZ.,  
OCTOBER AND NOVEMBER, 1950

Type Surface	Morning		Afternoon		Night	
	No.	%	No.	%	No.	%
Cylindrical Surfaces ( $\frac{1}{2}$ in. or Less)	412	26.7	202	20.2	609	34.0
Cloth and Paper Banners	507	32.9	317	31.7	961	53.6
Ceilings	54	3.5	14	1.3	106	5.9
Other*	569	36.9	468	46.8	117	6.5
<b>Total</b>	<b>1,542</b>	<b>100.0</b>	<b>1,001</b>	<b>100.0</b>	<b>1,793</b>	<b>100.0</b>

\*Dispersed on various surfaces (crates, produce, canned goods, counters, and others).

the attractant site, it is conjectural as to the results which can be expected with inexperienced personnel. If a standard of measurement can be provided which is not related to the grill but which is accurate and yet easily understood and learned by inexperienced personnel, the reconnaissance or visual survey method will in all probability replace the grill technique in the appraisal of community fly control programs.

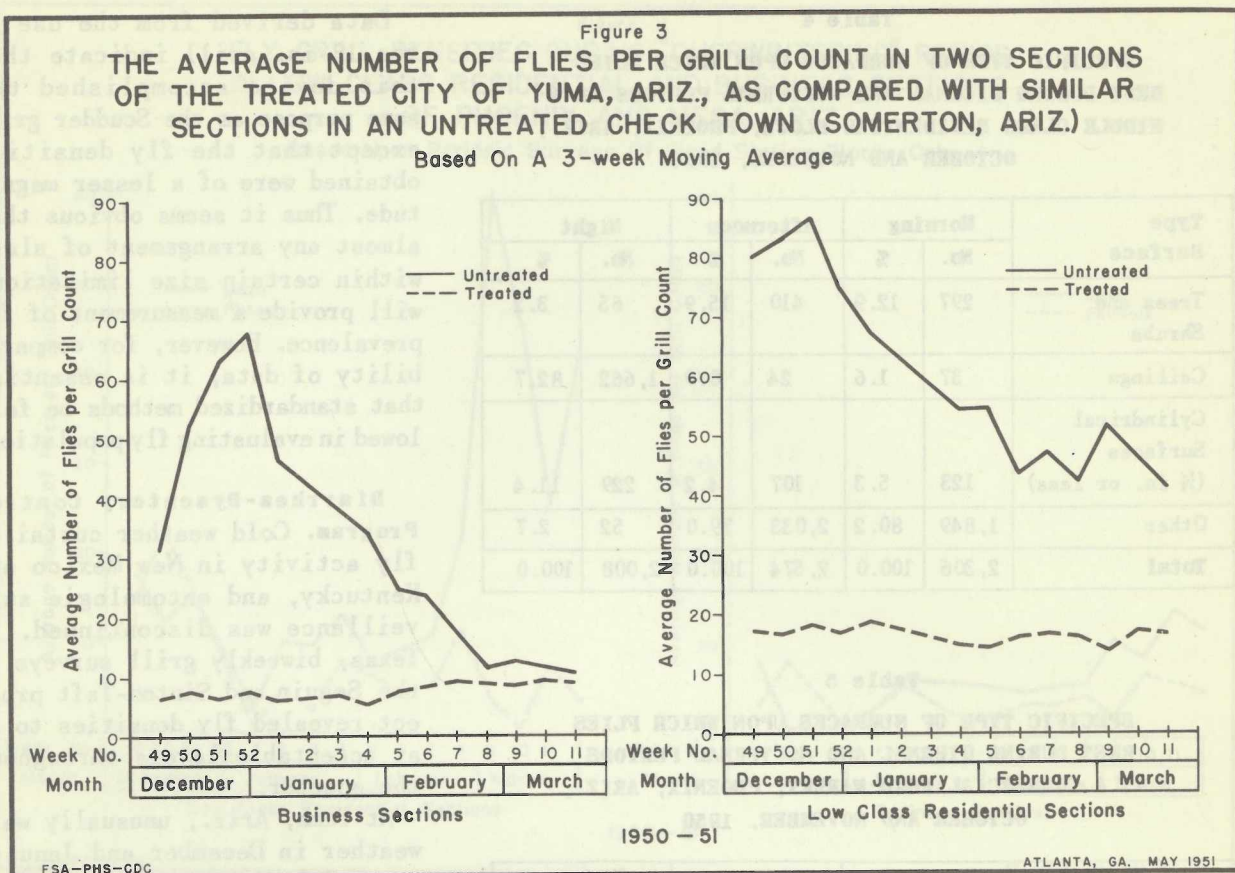
Data derived from the use of the 18-in. grill indicate that this device accomplished the same purpose as the Scudder grill except that the fly densities obtained were of a lesser magnitude. Thus it seems obvious that almost any arrangement of slats within certain size limitations will provide a measurement of fly prevalence. However, for comparability of data, it is essential that standardized methods be followed in evaluating fly populations.

**Diarrhea-Dysentery Control Program.** Cold weather curtailed fly activity in New Mexico and Kentucky, and entomologic surveillance was discontinued. In Texas, biweekly grill surveys at the Seguin and Sinton-Taft project revealed fly densities to be at acceptable levels throughout the quarter.

At Yuma, Ariz., unusually warm weather in December and January permitted extensive fly breeding which produced exceptionally high adult fly densities in several sections of the city. Even so, the fly counts averaged well below those of the untreated town of Somerton, Ariz., (figure 3). Because of the ineffectiveness of chlordan residual and space sprays, project personnel resorted to dieldrin (50 mg./sq. ft.) and heptachlor applications (40 mg./sq. ft.) which also proved ineffectual in reducing fly densities. House flies released in shelters treated with dieldrin survived 15-hour exposures with

no appreciable mortality; this indicated a high degree of resistance in the house fly population. Absence of any control by chemical means led to intensification of sanitational measures (general premises sanitation and improved garbage storage). Despite the success of the latter in raising sanitational levels, fly densities remained at relatively high levels through March.





#### THOMASVILLE, GA., STATION

Field activities of all types were sharply restricted due to the coldest weather recorded for many years. No operational work was planned for this quarter. The field observations scheduled could not be made. The only field activity that continued without significant interruption was the survey of fly breeding materials. At the end of the quarter there was no indication as to an expected date for resumption of field activities.

**Dysentery Studies.** The primary activities of this section were the analysis of fly density data previously collected, and comparison of such data with those collected through epidemiological studies; laboratory investigations of resistance in field flies versus laboratory flies (the former colonized for winter testing); and the establishment of certain short-term genetics investigations designed to interpret field observations.

Inasmuch as the analysis of fly data from this area was performed upon data from three

different survey methods, a recapitulation of the methods and their findings is in order. In January 1950, the Dysentery Studies Unit adopted three survey methods for sampling fly populations in all towns under treatment. It was hoped that a comparison could be made of the methods and a decision reached as to the method, or combination of methods, best suited for the determination of fly population indices. The three methods were run simultaneously throughout the 1950 fly season. These methods were: the "fixed block survey" in which the same blocks were inspected weekly throughout the year; the "random survey" in which all the blocks in an area had an equal chance of being in the weekly sample; and finally, the "visual" or "reconnaissance survey" wherein all the blocks in a town were rapidly examined each week. In the fixed block survey a series of weekly inspections were made which were designed to reflect the maximum value obtainable. The random survey was designed to insure



the applicability of statistical methods to the data, and make the indices from different towns comparable. The third method was new only in its all-inclusiveness, and in that it was systematically recorded; its usefulness depended upon a thorough familiarity of the inspectors in making fly density estimates with a grill. As contemplated for future use, the "repeatability" of the grilling process will be used as a standard for all inspectors.

On tabulating the data it was found that due to changes in procedure, losses due to weather, and errors in the selection of the samples, there were 14 weeks with comparable data for all three methods, and these 14 weeks gave a representative sample from the fifteenth to the forty-sixth week.

The experiment was planned to provide answers to the following questions:

1. Can the optimum block in a unit be selected unerringly for the fixed block survey, and does it change during the season?
2. How does the random index compare with the fixed block index?
3. How does the visual survey compare with the fixed and random?
4. May we use the visual survey for comparison purposes?
5. Which of the surveys is the most variable?

One of the basic assumptions behind the fixed block survey was that the most fly attractive block per unit always can be selected. If maldistributed, then a selection is made of a better located but comparable block. Out of the three towns in which there was a full complement of surveys, only one, Ochlochnee, and with only three units, vindicated this presumed ability to select with the chosen blocks consistently high. The other two towns, Boston and Pavo, had only 40 percent accuracy. Unfortunately, this does not mean that in all cases it would have been possible to select another block which would have given a better seasonal average. If a town is under treatment and a full visual survey is made, the selection of the fixed block may be controlled by keeping a cumulative average of all the blocks in the town. The number of fixed block changes will be

decreased considerably.

The comparison of the random with the fixed block surveys has produced a variety of answers. This inconsistency seems to indicate that the degree of homogeneity in the attractability or fly producing potential of all the blocks in the town, will determine the amount of difference to be expected between the fixed and random surveys. It further indicates that, of the two methods, the random sample will reflect the variability of the blocks within each town with more fidelity than will the fixed block method.

The more important comparison is that of the visual with the fixed and random surveys. In Ochlochnee, the visual had a lower seasonal mean than either the fixed or the random surveys. In both Boston and Pavo the means computed from the grilled data were either lower than, or equal to, the visual. The correlation of the visual with the fixed and random methods was 0.7 in either case. Therefore, as far as the data now available indicate, and under the same conditions as to the training of inspectors, the visual survey will be as likely to reflect the true fly population index as the other two surveys. The use of the visual survey (as tested) for comparing the fly densities in two different towns may be admitted with the reservation that all inspectors be thoroughly familiar with the grill.

Of the three surveys, as used in Thomasville, the random was the most variable from week to week within each town under treatment. This variability within each town may be attributed to two things, i. e. the size of the sample and the degree of homogeneity within the blocks in the town.

**Eye Gnat-Conjunctivitis Studies.** The laboratory colony of the gnat *Hippelates pusio* has been maintained successfully, but without great increase in size. The first adults of the second to fifth generations have emerged at an average interval of 29.5 days, and puparia of the sixth generation had begun to appear at the end of the quarter. Special studies have been made of the details of egg laying in these gnats.

**Rat and Rat-Ectoparasite Studies.** Intensive studies of previously collected data continue. Tentative recommendations have



been presented and are concerned with determinations of the extent and manner of typhus retention in rat reservoirs, methods for rat population studies, methods and cost of environmental rat control, and continuation of the measurements of the residual effectiveness of the 1946-47 DDT dusting operations.

**Epidemiological Studies.** Murine typhus fever investigations have been continued in the measurement of human incidence of the disease. Only one case, and that in Grady County with onset of illness in December 1950, has been confirmed this quarter. Numbers of cases and incidence rates by races in 1950 are shown in table 6.

Table 6  
CASES AND INCIDENCE RATE OF MURINE TYPHUS IN  
THREE GEORGIA COUNTIES

	Grady County		Thomas County		Brooks County	
	White	Negro	White	Negro	White	Negro
Cases	20	-	1	0	1	1
Population in 1000's	8.6	-	12.1	7.0	5.8	7.6
Incidence Rate per 100,000	233	-	8	-	17	13

Increasing usage of antibiotics, with little discrimination in all febrile illnesses, may necessitate a revision of case-finding techniques.

Epidemiological studies of diarrheal diseases were continued. Of 2,273 rectal swab cultures processed, 74 were positive for *Shigella alcalescens*, 28 positive for other *Shigella* species, and 16 positive for various *Salmonella* types. Rectal swabs from approximately 2,700 domestic animals were processed, and 29 were positive for *Salmonella* organisms. Of 235 animal patients at a local veterinary hospital, 68 were positive for *Salmonella* organisms and some were found to have diarrhea.

Epidemiological studies of conjunctivitis are being concluded, and analysis of data is currently under way. Collections of serum specimens from residents of the area are being continued. Preliminary analysis of school absentee records for white children during September and October 1950, indicates that conjunctivitis accounted for 10 to 25

per cent of such absences in the first three grades. At least 5 per cent of those in school were observed to have conjunctival symptoms. In colored children, both absences and symptoms were in smaller proportion.

#### NEW ENGLAND-NEW YORK INTER-AGENCY BASIN STUDIES

The Progress Report of the Public Health Insect Control Study and Report Group shows that outlines of the program to be followed including procedures, time schedules, and budget were approved at the first technical NENYIAC meeting in Boston February 14, 1951. The initial phase of the program involves (1) assemblage and analysis of existing information, both published and unpublished, on insects of public health importance, including incidence, significance, control measures, and effects of environmental factors; and (2) an immediate write-up of presently available data on one river basin to develop a form of presentation to serve as a guide and working plan for similar write-ups of other river basins. The second phase of the program calls for field surveys during the spring, summer, and fall, 1951-52 to supplement existing information.

Progress on the work is about on schedule. Various bibliographies and indices have been searched. Pertinent articles are being extracted and transferred to a card file which is set up on a river basin unit basis. Unpublished information is being secured through contacts with entomologists and others who have studied public health insects in the New England-New York area and this information is also being transferred to the cards. To date, many hundreds of records of insect collections and data pertaining to them have been gathered and recorded. Conferences to obtain unpublished information and sources of other unpublished information, and to plan the group's work including summer surveys have been held with the group member or his designated representative in the following States: Massachusetts, Rhode Island, Connecticut, and New Hampshire. Appointments have been tenta-



tively made for meetings in the remaining States, the last one being for May 4. All conferences have been highly successful, with utmost cooperation from all concerned. In addition to conferences with the group members in health departments, successful meetings to date have been held with members of the Departments of Entomology at the University of New Hampshire, the University of Rhode Island, and the University of Massachusetts; and the Department of Natural Sciences at Providence College, the Conn-

ecticut Agricultural Experiment Station at New Haven, and the Departments of Agriculture of Massachusetts and Rhode Island.

A preliminary write-up of the Pawkatuck River Basin which is to serve as the type study is near completion and soon will be submitted to the group for review and approval. This basin was selected for the initial write-up because of its small size and because the insects of public health importance are relatively well known in the area.

## LABORATORY SERVICES

### AIR SAMPLING STUDIES

Routine tests for bacteria in air have been conducted in the Virus, the Enteric Bacteriology, and the Mycology Laboratories. Impinger collection devices for direct microscopic examination and selective media for other samplers have been evaluated. Below are given general observations based upon use of sieve samplers, bubblers, and exposed plates.

#### SIEVE SAMPLING MACHINE:

By the use of 16 cm. differential pressure, and 1/8 in. orifice, 360 l. of air were sampled in 18 minutes. Heart infusion agar culture media were incubated at 37° C. for 24 hours in the routine test; incubation for 48 and 72 hours yielded higher colony counts.

Findings were recorded from (a) total colony count, and (b) differential count based upon chromogenesis, colony structure, colony size, Gram's stain reaction, and microscopic morphology. At present, records show percentage of types based upon only tinctorial and morphological characteristics.

1. Very few spore-formers were present.
2. Very few chromogens were present.
3. Very few spreaders were present.
4. Total counts exceeding 200 per plate were infrequent.
5. Small and minute colonies constituted a large proportion of the gross count.
6. Total counts were generally reduced during stormy weather.

7. On two occasions water in flowmeter froze.
8. Traps must be installed in air circuit.
9. Simple open plates exposed for identical times beside sampler did not always yield counts similar to those from machine collections (table 1).

#### BUBBLER-TYPE SAMPLING MACHINE:

Results from this study were unsatisfactory under tested conditions. Air was bubbled through 30 ml. of liquid medium in a 125 ml. side-arm flask under varying pressure conditions and for various time periods. From the medium in the flask (heart infusion broth, thioglycolate broth, dextrose broth, or semisolid agar-gelatin medium), samples were tested in agar plates by (a) adding 1 ml. broth to 15 ml. of 1.5 percent agar, or (b) 10 ml. sample to

Table 1  
COMPARISON OF MACHINE SAMPLE AND OPEN  
PLATE TOTAL BACTERIAL COLONY COUNTS

Date	Machine Sample		Open Plate	
	AM	PM	AM	PM
February 23	152	137	72	78
February 26	107	255	64	135
February 27	78	136	36	84
February 28	117	131	72	91
March 1	149	300	106	105
March 2	144	195	28	680
March 5	23	24	227	32
March 6	30	48	54	232



2 ml. of 10 percent agar.

1. Insignificant evaporation of broth was found during the test period.
2. In many experiments few colonies appeared in plates from 1 and 10 ml. samples, while counts on open control plates prepared as with the sieve samplers showed large numbers of colonies.

#### OPEN PLATES EXPOSED INDOORS FOR LONG PERIODS OF TIME:

Agar plates were opened and exposed for longer periods of time in a relatively unfrequented room to study indoor bacterial populations and to compare these collections with outdoor total and differential counts.

Rates of collection ranged from 12, 16, and 30 colonies per hour during daytime periods to 1 colony per hour or less at night; these rates are much lower than those for 18-minute outdoor collections listed above.

Differential examination showed types percentages similar to those for bacteria entrapped outdoors.

#### BACTERIOLOGY LABORATORY ACTIVITIES

Activities of the Bacteriology Laboratory are shown by the map on page 29.

#### PROPOSED CDC BUILDING FEATURES TESTED

Working in close collaboration with the Engineering Services, CDC, it has been possible to test several of the features planned for use in the Proposed CDC Building. The new *Streptococcus* Laboratories at Lawson will contain a metal partition wall, an asbestos partition wall and sterile room, and a cinder-block wall on which two types of plaster-cement and finish can be compared. A new economical device for removing pathogens from infectious hood effluent air has been designed for test installation at the Virus and Rickettsia Laboratory, Montgomery, Ala.

It has been possible to obtain unit sets of various laboratory furniture table-tops and sinks for test use; other furniture types have been designed and built at Montgomery to reduce costs and to better meet particular needs.

Consultation and materials were provided for use in space at Laboratory Services, Chamblee, Ga., to demonstrate the use of color to demarcate boundaries, to alleviate the feeling of crowding in closed halls, to create better working conditions, and to relieve the gloom of windowless space — all of which will be problems in the proposed laboratories.

For animal housing, several floor finish mate-

rials have been provided and plans made for construction of a new type of cage rack.

#### PLAGUE

##### HUMAN CASE:

On January 6, 1951, a man in Hobbs, N. Mex., became ill. While hunting east of Hobbs along the New Mexico-Texas boundary on January 2, he shot and dressed eight rabbits. On the morning of January 9, he reported to a physician who administered penicillin, streptomycin, and sulfadiazine. The man died that afternoon. This is the second case of human plague from that area in a year. Both cases had recent contact with wild rabbits.

The patient had a bubo in the left axilla; cultural study on material from this lesion as well as on venous blood yielded *Pasteurella pestis* at the laboratories of the New Mexico State Health Department and at the Western CDC Laboratory. For a report of a survey made in connection with this case see table 2. Two counties were surveyed during this study.

##### WILD RODENT PLAGUE:

Collections from the State of Washington were examined without finding evidence of plague.

Rodent and ectoparasite collections with Loma Linda College, Calif., were examined for plague without positive results.

For the Army's Sandia base in New Mexico, plague was sought unsuccessfully in 52 rodents and 129 fleas.

At San Francisco, autopsy examination of 2,716 rats trapped in San Francisco and 43 rats from vessels showed no evidence of plague. From San Francisco, Seattle, and Tacoma, 11,083 fleas from 3,383 rats did not yield plague.

##### PLAGUE ECOLOGY STUDY:

During the past 14 years the Western CDC Laboratory has been making routine surveys for plague foci. In attempts to prevent scattered rural human cases of plague and to lessen danger for urban populations from plague in wild animal reservoirs, the Laboratory will begin intensive ecological studies of wild rodents in a single area.

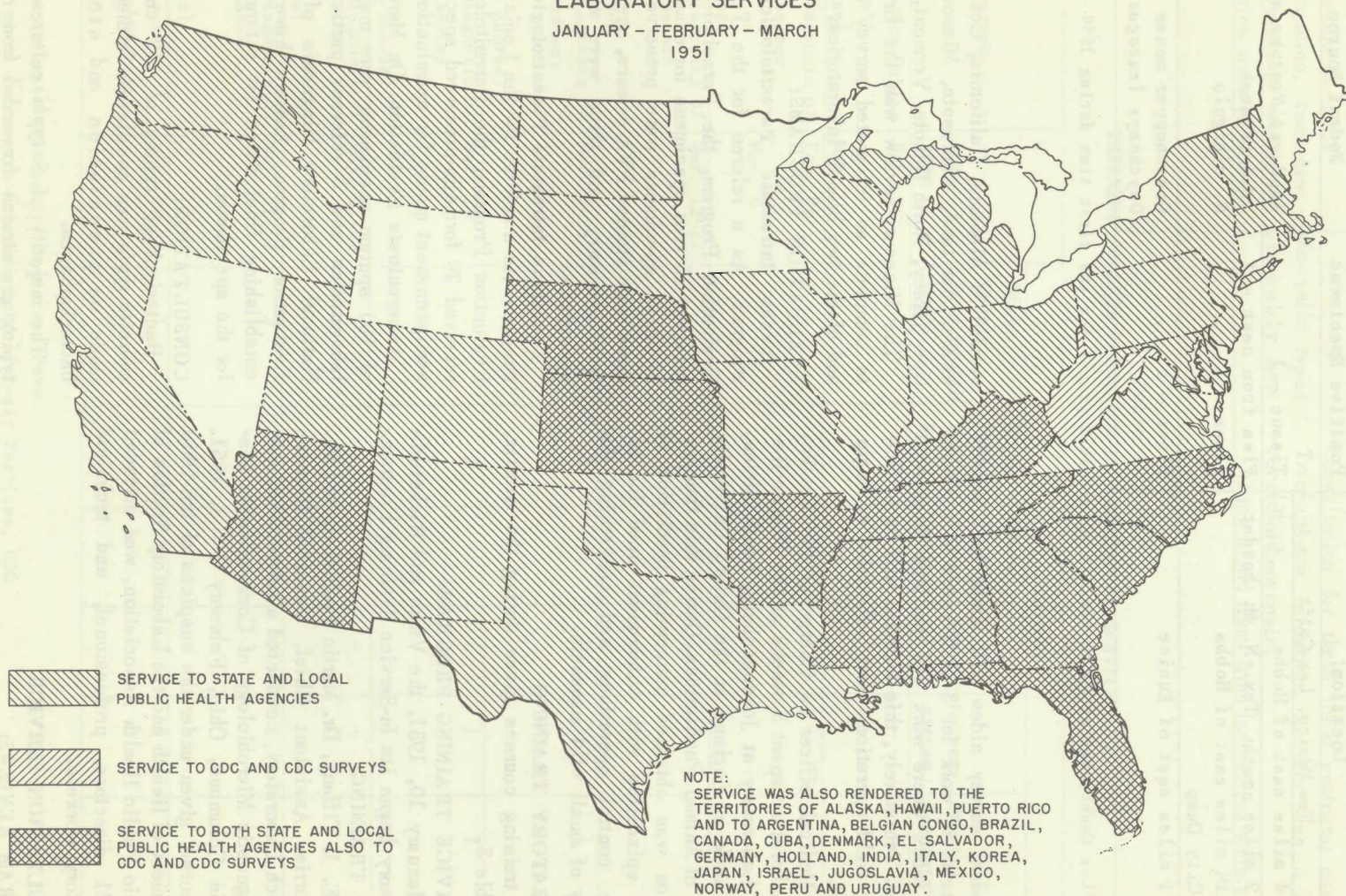
To attempt prediction of epizootics, fluctuations in rodent populations and their causes will be studied. To study inter-species movement of plague the principal reservoirs and principal vectors will be determined. Practical control of wild rodent plague through "Species Sanitation" may result from determination of how plague persists through the winter seasons.

A mammalian ecologist, an entomologist, and



# ACTIVITIES OF BACTERIOLOGY SECTION LABORATORY SERVICES

JANUARY - FEBRUARY - MARCH  
1951



FSA-PHS-CDC

ATLANTA, GA. MAY 1951



Table 2  
WILD RODENT PLAGUE DEMONSTRATED  
JANUARY - MARCH 1951

Location:	Positive Specimens	Rodent Source
New Mexico, Lea Co.*:		
4 miles east of Hobbs	Tissue - 1	Wood rat <i>Neotoma albigula</i>
2 miles south, Tex.-N. M. border	Flea from nest - 1	Dead in nest
1½ miles east of Hobbs City Dump	Fleas - 1	<i>N. albigula</i>
4 miles east of Eunice	Fleas - 1	Grasshopper mouse <i>Onychomys leucogaster</i>

\*Lea County was shown to contain wild-rodent plague for the first time during 1950

four rodent survey aides will made up a survey study team to work for 3 to 5 years in a known plague focus where work can continue throughout the year. Tentatively, this location will be in New Mexico; field operations were scheduled to begin in April.

The Medical officer in Charge of the Western CDC Laboratory spent 5 weeks at the Plague Research Laboratory at Johannesburg, South Africa, and 1 week in England at the Oxford University Bureau of Animal Populations. During this time, information was obtained concerning prediction of plague epizootics with subsequent need for intensive control operations and concerning the ecology of small wild mammals.

#### LABORATORY TRAINING

For training courses given during the quarter, see table 3.

#### IN-SERVICE TRAINING PROGRAM:

On January 10, 1951, the Virus and Rickettsia Laboratory began its In-Service Training Program. FIELD TRAINING:

Dr. E. J. Tiffany, Dr. Martin Frobisher, and Mr. Ad Harris, Assistant Chief, Venereal Disease Research Laboratory, conducted a refresher course in Diagnostic Microbiology of Communicable Disease in Columbus, Ohio, February 1 - 3, 1951. The course, given under the auspices of the Ohio Department of Health and the Laboratory Section of the Ohio Public Health Association, was attended by 121 directors, professional, and technical laboratory workers.

#### CONSULTATION SERVICE

##### PROGRAM REVIEWS:

In making program reviews for 12 State department of health laboratories, facilities were re-

viewed in Alabama, California, Connecticut, Delaware, Maryland, Minnesota, Missouri, Nebraska, New Jersey, North Dakota, Vermont, and Virginia.

The Missouri review was the first opportunity to complete an integrated survey of the central and of the two branch laboratories.

#### EVALUATION PROGRAMS:

**Texas Intrastate Parasitological Evaluation Program.** As a referee for the Texas Intrastate Evaluation Program, the Parasitology Laboratory received 15 test specimens for examination. Eight of these specimens were preserved in formalin, three were stained PVA smears, one was a stained fecal smear, and three were saline-preserved specimens.

**Louisiana Intrastate Parasitological Evaluation Program.** As a referee for the Louisiana Intrastate Evaluation Program, the Parasitology Laboratory received 29 formalin-preserved specimens and one semipermanent mount for examination.

**Tuberculosis Evaluation.** On March 13 the last of 100 sputum specimens were mailed to the 54 laboratories and 3 referees participating in the National Laboratory Diagnosis of Tuberculosis Evaluation Program. Letters have been mailed, establishing final dates for return of diagnoses for the specimens.

#### CONSULTATION:

Bacteriophage typing of 112 cultures of *Salmonella typhi* was completed; further progress was made on preparation and stockpiling of bacteriophages.

The majority of *S. typhi* cultures submitted for typing are strains forwarded from regional typing laboratories where they were found difficult to determine. A special effort is made to assist the



regional laboratories, but all too often the specimens are degraded or lysogenic forms carrying Vi or O bacteriophage; frequently these cultures have been maintained too long on artificial media before submission to CDC.

For confirmation, two new *Salmonella* types and three organisms which are probably new *Shigella* species were received.

Diagnostic serums were prepared as follows: *Salmonella* polyvalent serum, 3,000 ml.; *Shigella* serums, 3,100 ml.; paracolon serums, 2,900 ml.

The Mycology Laboratory provided diagnostic consultation for three local patients; one was a *Trichophyton* infection, another was a case of coccidioidomycosis.

Thick blood films from Indo-China were examined

Table 3  
TRAINING COURSES PRESENTED BY LABORATORY SERVICES

Courses	Date 1951	Students						
		State, County, City Health Depts.	U. S. Public Health Service	Other Federal Organi- zations	Hospi- tals	Univer- sities	Foreign Students*	Total
Microbiology for Public Health Nurses** (Second course)	Feb. 26 to Mar. 2	7	3	-	-	-	-	10
Laboratory Diagnosis of Bacterial Diseases Part 1 (Fourth course)	Feb. 26 to Mar. 9	1	2	1	1	1	-	6
Laboratory Diagnosis of Bacterial Diseases Part 2 (Fourth course)	Mar. 12-23	1	2	2	1	1	1	8
Laboratory Diagnosis of Parasitic Diseases Part 1 (Seventeenth course)	Mar. 5-23	6	3	1	5	2	1	18
Laboratory Diagnosis of Parasitic Diseases Part 2 (Seventeenth course)	Mar. 26 to Apr. 13	1	2	2	2	1	1	9
Laboratory Diagnosis of Syphilis*** (Sixth course)	Mar. 12-23	1	-	-	-	-	1	2
Laboratory Diagnosis of Enteric Diseases Part 1 (Third course)	Mar. 26-30	2	-	1	2	1	-	6
Typing of <i>Coryne- bacterium diphtheriae</i> (First course)	Mar. 26-30	1	-	-	-	1	-	2

\*Foreign students represented India and Peru.

\*\*Course given in cooperation with Epidemiologic Services, CDC

\*\*\*Course given in cooperation with Venereal Disease Research Laboratories, Division of Venereal Disease.



for malaria parasites as a service to ECA. Of 155 films examined, 20 contained malaria parasites, as follows: *Plasmodium falciparum* - 9; *P. vivax* - 6; *P. malariae* - 1; *P. falciparum* and *P. vivax* - 1; and undetermined - 3.

#### DIAGNOSTIC SERVICES

##### PARASITOLOGICAL SPECIMENS:

Of 489 reference specimens examined, 217 were found to be positive for intestinal parasites. *Endamoeba histolytica* was found in 84 specimens, 42 of which were from a special study; 23 of the 42 were diagnosed by PVA-fixative technique only.

Specimens of particular interest included a liver cyst from the Veterans' Administration Hospital Facility, Chamblee, Ga., caused by *Echinococcus*; a dog fecal specimen from Florida containing *Diphyllobothrium* eggs; and a human fecal specimen from Massachusetts containing oocysts of *Iso spora*. Examination of pickled pigs' feet from New Jersey for trichinae proved unsuccessful. Five pack rat hearts from Texas were sectioned and examined for *Trypanosoma cruzi*; all were negative.

Unusual specimens of mites were received from Alaska, Indiana, Alabama, and Florida. One shipment from Tampa, Fla., included the fourth finding of *Pneumonyssus caninum* Chandler from the upper respiratory passages of the dog.

##### MYCOLOGY:

A total of 292 requests for diagnostic services, comprising 459 cultures and clinical specimens was received from 34 States, Hawaii, and Canada. These specimens required 1,045 tests for identification. The following pathogenic fungi were isolated and/or identified:

*Candida albicans*, 133; *Microsporum Audouini*, 10; *Microsporum canis*, 8; *Trichophyton mentagrophytes*, 8; *Coccidioides immitis*, 6; *Nocardia tenuis*, 2; *Nocardia asteroides*, 1; *Trichophyton rubrum*, 1; *Trichophyton schoenleinii*, 1; and *Cryptococcus neoformans*, 1.

##### VIRUS AND RICKETTSIA:

The Virus and Rickettsia Laboratory received 696 reference diagnosis specimens from 31 States, Alaska, and Puerto Rico; 230 of these came from Federal agencies, 237 from State and local public health agencies. Complement fixation tests totaled 2,338, of which 1 was positive for St. Louis encephalitis and 43 for mumps. Over 130 attempts to isolate virus yielded 2 isolations of Coxsackie virus (Florida) and 6 isolations of A-prime influenza virus (Alabama).

The Veterinary Laboratory examined 34 specimens for virus to find one isolation of psittacosis, and 6 isolations of rabies.

In the Streptococcus Laboratory about half the referred cultures were received from other CDC studies, i. e., the Nursing Bacteriology Laboratory and the survey conducted by the Special Bacteriology Laboratory with the Arizona State Health Department. All the cultures received from the Nursing Bacteriology Laboratory were alpha-hemolytic or gamma type streptococci and approximately 5 percent reacted with grouping serums.

##### MISCELLANEOUS CULTURES:

Among the 58 serums submitted for *Brucella* agglutination tests, 20 percent were positive. From two New England State departments of health, 4 of 14 serums gave positive reactions with tularemia antigen.

There were 2,193 specimens submitted for detection of amebiasis antibodies, of which 23 percent were positive; 455 serums for trichinosis included 7 percent positives; of 84 serums for echinococcosis, 7 percent were positive (2 from Georgia, 2 from New York, 1 from North Carolina, and 1 from Pennsylvania).

##### METHODOLOGY RESEARCH

The study and development of procedures for the detection of *Histoplasma capsulatum* in soil by indirect methods continued. To date, *H. capsulatum* has been isolated from two soil samples and *Allescheria Boydii* from two other samples. Findings from such investigations are directly applicable to recovery and identification of air-borne organisms.

The year-long examination of vaseline-coated slides, exposed in Williamson County, Tenn., for spores of *H. capsulatum* has been terminated. All slides were negative. It is believed that, if spores of *H. capsulatum* are present in the air of Williamson County, other methods will have to be developed to detect their presence.

A selective medium for the isolation of *C. immitis* from contaminated materials has been perfected and tested under laboratory conditions.

A key has been prepared as an aid in identifying the agents of human mycoses by the form of the fungus elements in tissues.

##### ENCEPHALITIS:

**Louisiana Survey.** The serums of wild birds collected during the summer and fall of 1950 were tested for neutralizing antibodies to Western equine



encephalomyelitis (W.E.E.). It will be noted that only two species of birds (white ibis and black-crowned night herons) possessed antibodies to W.E.E. Both of these species were collected near Pontchatoula, La. The total incidence of antibodies to W.E.E. in Louisiana wild birds is quite low (4.63 percent). The corresponding figure for antibodies to the Eastern virus is 17.9 percent.

The remaining arthropod collections from the 1947 Louisiana Eastern equine encephalomyelitis (E.E.E.) survey were tested for virus; 1,636 arthropods in 44 lots yielded no virus.

**E.E.E. Antibody Level in Horses.** Horse No. 5\* was bled at regular intervals and the serums tested for neutralizing and complement-fixing antibodies. The neutralizing antibodies to E.E.E. have remained at a rather constant level to the present time. Complement-fixing antibodies to E.E.E. gradually fell in titer until they disappeared 219 days (7 months) after inoculation.

#### RABIES:

**Duration of Rabies Immunity Experiment.** All vaccinated dogs were bled in January, 1 year after vaccination. This bleeding is the third postvaccinal bleeding sample taken.

#### ANIMAL INFLUENZA:

On March 7, 1951, a report of suspected swine influenza in Metter, Ga., was investigated. Hemagglutination-inhibition tests have been performed on the eight pig serums collected. All the samples were negative against swine (Wisc.), A (PR8), and B (Lee) strains of influenza. One pig showed a titer of 1:40 against A-prime (FM-1), while the remaining seven serums had titers of 1:20 against A-prime influenza virus.

#### ENTOMOLOGY:

Mite life cycle studies (at 79° to 83° F. and approximately 60 to 70 percent relative humidity) are partially completed. The following summarizes the observations to date:

*Dermanyssus gallinae.* Females lay from 1 to 10 eggs within 48 to 72 hours after a complete blood meal. One to three days are required for eggs to hatch to the six-legged, nonfeeding larval stage. The larvae usually moult within 24 hours to form the first feeding stage (eight-legged protonymph). Within 2 days after a complete blood meal, the protonymph moults to the second feeding stage, the deutonymph. In no more than 2 days after the deutonymph engorges on blood, the final moult to the adult

male or female takes place. The complete cycle seems to require approximately 10 to 11 days.

*Liponyssus bursa.* It has been observed that one to six eggs are laid by fully engorged females. Laying is completed within 48 hours after the blood meal and the eggs hatch in 1 to 3 days to form six-legged larvae. These moult without feeding within 24 hours to become eight-legged, blood-feeding protonymphs. After full engorgement, 1 to 2 days are required for moulting to the deutonymph stage, which is nonfeeding. Another moult occurs within a day, giving rise to the adult male or female. Approximately 8 to 10 days are required for the complete cycle.

*Liponyssus sylviarum.* The life cycle is similar to that of *L. bursa*. Studies in all three species are being continued.

#### THE ROLE OF BIRDS MITES IN THE TRANSMISSION OF E.E.E.:

**"D. Gallinae."** A large number of mites was fed upon chicks with E.E.E. blood titers of  $10^{-5}$ . These mites were then maintained as a colony by permitting them to feed upon normal chicks once each week. Samples of mites were withdrawn from the colony periodically and tested for virus. The normal chicks were bled and brains taken for attempts at virus isolation at 24, 48, and 72 hours after their introduction into the "infected" mite colony.

The virus was demonstrated in all lots of mites tested for the first 4 days after the infective feeding. One lot of 100 mites tested after 15 days was shown to contain virus. One transmission to a young chick was effected on the 26th day. The other lots of mites and chicks were tested with negative results. No transovarian passage was demonstrated.

#### CONGLUTININ COMPLEMENT ABSORPTION TESTS:

Preliminary studies of the conglutinin complement absorption tests have been made to test its applicability to the diagnosis of neurotropic and other viral diseases. Normal horse serum was used as the source of nonhemolytic complement.

#### SEROLOGIC STUDIES:

Work on the serologic relationships of various species of *Leptospira* by use of the agglutination absorption technique is being continued.

An encapsulated culture of *Shigella boydii* 2 was studied; results indicated that the capsular

\*See CDC Bulletin X(3): 28, March 1951.



antigen of this isolate is common to the majority of strains of that type in which it is a heat labile antigen inhibiting O agglutination of the organisms.

Progress continued in the serologic classification of the Bethesda-Ballerup paracolon bacteria; 10 new O groups were added in the tentative classification of the Providence (29911) paracolon group. Serologic studies of 49 capsular types of *Klebsiella* were completed.

Viable *Mycobacterium tuberculosis* cells reduce tri-phenyltetrazolium chloride to the red formazan; thus the number of viable organisms in standardized BCG vaccine preparations may be rapidly estimated.

The hemagglutination test in tuberculosis (Middlebrook-Dubos, Rothbard modification), in its present form is neither sensitive nor specific enough for routine use as a diagnostic aid.

Studies have begun to confirm the reported cortisone enhancement of tuberculosis spread in experimental mice. Rapid differentiation of virulent and nonvirulent tubercle bacilli will be attempted by mouse cortisonization.

#### DIAGNOSTIC STUDIES:

A total of 1,046 tests was performed as follows with material submitted by the Midwestern CDC Services:

VIRUS ISOLATION			
TESTS	Negative	Positive	Under Test
Bird Serums	60	0	1
NEUTRALIZATION			
TESTS	Negative	Positive	Serum Unsatisfactory
Eastern E. E.	17	0	0
Western E. E.	476	124	0
St. Louis E.	380	145	4

Of the 124 serums positive against W.E.E. virus, 11 have been titered; among the 145 positive against the St. Louis Virus, 24 have been titered. The remaining positive serums will be titered as the availability of mice permits.

From the Midwestern CDC Services, 486 serums were tested for complement-fixing *Histoplasma* antibodies. For typhus control activities, 17 serums from Thomasville, Ga., and 14 serums from Arkansas were tested for evidence of infection. Table 4 shows complement fixation tests on rat serums for murine typhus.

#### MALARIA BLOOD FILMS FROM CDC SURVEYS:

Of the 11,439 slides on hand or collected during

the quarter, 5,607 were examined for malaria parasites:

	Total	Negative	Unsatisfactory	Positive
South Carolina	5,577	5,528	34	15 (known "control" positives)
Georgia	30	30	—	—
Total	5,607	5,558	34	15

#### ECTOPARASITE SURVEYS:

The identification of ectoparasites of rats collected by the typhus control activities of the State health departments has been expanded this quarter to include all ectoparasites (a total of 5,108 specimens of fleas, lice, and mites) from the State of Georgia.

One hundred and ninety-four ectoparasites were collected from rats in an area of Wayne County, Ohio, where a clinical case of typhus was contracted. This is north of the usual typhus belt in the United States. The samples included 18 *Xenopsylla cheopis*, 138 *Polyplax spinulosa*, 38 *Bdellonyssus bactoci*, all species which have been reported in the literature as vectors of murine typhus.

#### GEORGIA HISTOPLASMIN SURVEY:

In cooperation with the Alto Medical Center, a State-wide survey of the incidence of histoplasmin sensitivity has been initiated.

Table 4

#### COMPLEMENT FIXATION TESTS ON RAT SERUMS FOR MURINE TYPHUS

Source	Total No. Serums	Percent Pos. 1:8+
Alabama	1,028	20.4
Arkansas	506	3.6
Florida	308	5.5
Georgia	624	11.7
Hawaii	24	20.8
Kentucky	11	0
Mississippi	84	0
Nebraska	10	0
North Carolina	248	1.2
South Carolina	134	1.5
Tennessee	54	3.7
Total	3,031	10.9



#### EXAMINATION FOR TULAREMIA:

The examination of specimens from the State of Arkansas continued with no tularemia detected in 15 rodents and 30 ticks.

#### EPIDEMIOLOGICAL SUPPORT

##### PAULDING POLIOMYELITIS COMMITTEE:

At the meeting of the Paulding Poliomyelitis Committee held in Montgomery, Ala., it was decided to test specimens collected from persons with Hidalgo County, Tex., history during 1950

for the presence of poliomyelitis virus and to type two strains. Since many migrant workers in Paulding, Ohio, came from Hidalgo County, it was thought interesting to determine whether the Paulding and Hidalgo types were the same. One of ten family-pool specimens from Paulding, Ohio, yielded poliomyelitis virus; all of three specimens from Hidalgo County, Tex., contained poliomyelitis virus. Results from challenge inocula will be reported later.

## TECHNICAL DEVELOPMENT SERVICES\*

*(This report presents results of work in progress and the conclusions reached may not be final. For this reason, the contents should not be published or referred to in articles for publication without permission. Reference in this report to any commercial materials or equipment does not in any way constitute a recommendation of such materials or equipment by the U. S. Public Health Service.)*

#### CHEMICAL STUDIES

**Synergists for DDT.** The search for compounds which would improve the effectiveness of DDT against resistant house flies has been extended and approximately 1,200 compounds have been screened. Of these, 10 gave 70 to 100 percent mortality of female house flies in the Roberds' resistant strain, when tested in conjunction with DDT; 25 gave 40 to 70 percent; 117 gave 10 to 40 percent; and the remainder gave less than 10 percent mortality when so tested. It is proposed that among the DDT analogs a relationship might exist between synergistic activity and ease of dehydrohalogenation of these compounds.

**Sampling and Analysis of Air for Chlordan Vapors.** A procedure for sampling air containing chlordan vapors utilizing traps immersed in dry ice acetone baths has been developed. The condensed chlordan vapors may be analyzed by the Davidow method if 50 micrograms or more are present. In experimentally treated chambers 25-30 micrograms of chlordan per cu. ft. of air were found 2 hours after treatment. A relatively rapid drop in concentration occurred during the first

2 to 3 weeks after which the concentration changed very slowly, being around 3 to 4 micrograms per cu. ft. 8 weeks after treatment. The analysis data parallel mortality data on flies exposed to the atmospheres.

#### TOXICOLOGY

##### TOXICITY OF DIELDRIN:

**Effect of Topical Applications of Dieldrin Emulsion on the Hamster.** Hamsters have proved to be useful animals for testing antidotes. Tests on a small number of animals suggest that hamsters are slightly more resistant than rats to dermal doses of dieldrin given at the rate of 20 mg./kg./day.

**Median Lethal Dose Values for Albino Rats of the Sherman Strain Poisoned with Dermal Applications of Dieldrin Solutions.** Male rats of the Sherman strain show the same dermal LD<sub>50</sub> as do males of the Wistar strain.\*\* Females of the Sherman strain are slightly more susceptible than are females of the Wistar strain and both strains show a greater sensitivity of the females as compared with the males.

**Effect of Single Dermal Applications of Various Dieldrin Emulsions on the Rabbit: Comparison of Sensitivity Based on Sex.** Preliminary data suggest that rabbits may be more resistant to single doses and less resistant to multiple small doses of dieldrin than are rats.

\* Abstracted from Technical Development Services Summary of Activities No. 25, January, February, and March 1951.

\*\* See CDC Bulletin X(3):31, March 1951.



**Acute and Chronic Toxicity of Water-Wettable Dieldrin Powder to the Rat.** Twenty-five percent water-wettable dieldrin powder applied to the skin of rats at the rate of 400 mg./kg. proved highly toxic. There is no evidence that the diluting dust used in formulating 25 percent powder interferes with the absorption of dieldrin.

**Effect of Topical Applications of Various Formulations on the Monkey.** Single doses of technical dieldrin applied to the skin of monkeys at the rate of 400 mg./kg. failed to produce any evidence of toxicity. The application of 1.25 percent emulsion at the rate of 20 mg./kg./day, 5 days a week, produced convulsions in four monkeys after 24 to 101 doses. Although dosage was discontinued after the first convulsion, all the animals died.

**Use of Barbiturates in the Treatment of Various Species of Poisoned Laboratory Animals.** Two monkeys treated with technical dieldrin at the rate of 20 mg./kg./day, 5 days a week, developed convulsions but later recovered following prolonged administration of sodium phenobarbital. The number of doses of technical powder required to produce convulsions is not significantly different from the number of doses of 1.25 percent emulsion when both are given at the rate of 20 mg./kg./day.

#### PHYSIOLOGICAL STUDIES:

**Effect of Dieldrin on Liver Phospholipids in Rats.** The values for phospholipids expressed as a percentage of total lipid varied from 41.1 percent in animals poisoned by dieldrin to 78.5 percent in unpoisoned animals starved to the same degree. This is in line with the conclusion drawn earlier suggesting that dieldrin poisoning interferes with the metabolism or mobilization of fats in the liver, thereby causing their accumulation in that organ.

**Effect of Lipotropic Agents on Liver Changes during Dieldrin Poisoning in the Rat.** Two experiments were conducted to determine whether drugs usually considered as lipotropic agents would affect the fat metabolism in the liver of rats poisoned by dieldrin. One experiment was done with a mixture of choline, inositol, and manganese acetate and one with vitamin B<sub>12</sub> alone. In neither experiment was there evidence that the drugs used actually had an effect on the metabolism of animals poisoned by dieldrin or of unpoisoned animals starved to the same degree.

**Basal Metabolic Rate Studies in Dieldrin-Poisoned Rats.** Earlier tests have shown that the metabolic rate of rats subacutely poisoned by dieldrin is normal. Tests of rats that have received repeated small doses of dieldrin to a total dosage

ranging from 3,400 to 7,680 mg./kg. show that their metabolic rate is also normal.

#### TOXICITY OF DDT:

**Clinical Studies of DDT Storage Levels in Human Fat.** A total of 17 analyses of human fat for DDT content is reported. The samples were taken from 16 persons, 2 of whom had extensive exposure. The DDT content of the fat expressed in parts per million varied from 0 to 38 for persons with no known exposure and from 91 to 291 in the two persons with extensive exposure.

One of the cases with extensive occupational exposure, case 14 (a spray operator) showed signs of hypertensive cardiovascular disease with renal pathology and some associated liver disfunction. There was evidence that this condition had existed well over 5 months. He also suffered from an exematoid dermatitis which had been developing for a period of 5 months and was the cause of his coming to the hospital. Analysis showed 91 p.p.m. of DDT in his fat. There was, however, no evidence that exposure to DDT had influenced either disease condition. Patch and transfer tests showed no relationship between DDT (or its diluents) and the dermatitis. As was true in this instance, the true cause of this form of dermatitis is seldom demonstrated. Recognized predisposing causes, such as medication with heavy metals, were denied by the patient. His hospital course was uneventful and the dermatitis regressed at about the usual rate for such cases.

Case 15 had no complaints whatever and was brought to the hospital entirely for study because it was known that his exposure to DDT, as a formulator of concentrates, was far in excess of the ordinary spray crew member. He has been examined on two separate occasions, first near the end of his 5th year of exposure and, second, after a 6-month rest period following his 6th year of exposure. The first fat sample showed 291 p.p.m. of DDT and the second sample taken after additional exposure followed by a period of rest showed 240 p.p.m. It would appear that this worker may have reached an equilibrium between intake and elimination of DDT. To be sure, if a sample could have been obtained after the 6th season and before any rest period, the amount of DDT in the fat may well have been higher than was found after a period of rest which allowed for some excretion. The only abnormality found in this patient was a low PSP kidney function test in the first examination; this same test was essentially normal on the second examination. In any event, it would be difficult



to attach any significance as regards exposure to DDT to an abnormality in this test because the patient had received anti-luetic treatment with heavy metals only 1 year before the first examination.

#### TOXICITY OF DDT:

**Absorption, Distribution, Storage, and Excretion of  $I^{131}$ -labeled 1,1,1-Trichloro-2,2-bis(p-iodophenyl) Ethane in Laboratory Animals following Dosing by Various Routes.** The results of the experiments reported here on the absorption, distribution, storage, and excretion of DDT following administration to laboratory animals by various routes may be summarized as follows: (1) Absorption and subsequent wide dispersion of DDT following dermal application was irregular, but sometimes did occur. No change in the amount or rate of this absorption was shown following use of peripheral and cardiac circulatory stimulants. (2) After oral administration, a large part of the DDT was eliminated in the feces. This is thought to represent unabsorbed material. (3) Irregular absorption of toxicant took place following subdermal implantation, the majority of the material being walled off as a foreign body. (4) A solution of DDT in oil which in turn formed the discontinuous phase of an emulsion proved to be a satisfactory vehicle for intravenous dosing. (5) An accumulation of active material occurred in the lungs, liver, and spleen after intravenous administration. (6) Fecal excretion of DDT followed its parenteral administration. This may represent excretion in the bile or by a portion of the intestine. (7) Storage of DDT in fat took place following the introduction by all routes studied. (8) There appeared to be a constant exchange between administered DDT and that stored in the fat. (9) No inorganic or organic breakdown products of DDT could be found in any of the animals tested. (10) There appeared to be at least some correlation between the occurrence of neurological symptoms and the presence of DDT in the brain at the same time. It should be recognized that these observations may have little relationship to the behavior of DDT.

#### TOXICITY OF LINDANE:

**Effect of Topical Application of Emulsion on Rats.** Toxicity tests are being continued with lindane applied to the skin of white rats. Three rats which have received 285 doses of 1.25 percent emulsion at the rate of 20 mg./kg. appear healthy as evidenced by an average weight gain of 559 percent. Two rats in the test have died. One rat

died of intercurrent infection on the 279th experiment day after receiving 184 doses of lindane. The second rat died after receiving 262 doses, and showed minimal signs of lindane poisoning at autopsy.

**Effect of Various Formulations on Sheep.** A single sheep proved far more resistant to lindane applied dermally than are rabbits or cattle. In a subsequent test the sheep was quickly killed by a single intravenous dose of 22 mg./kg. This suggests that the sheep absorbs lindane very poorly from the skin.

#### CHEMICAL STUDIES:

**Synthesis of Radioactive Iodine  $I^{131}$  Analog of DDT.** A method of synthesis of  $I^{131}$ -labeled p-iodophenyl analog of DDT, 1,1,1-trichloro-2,2-bis(p-iodophenyl) ethane is described. The over-all yield based on NaI or aniline was 22.5 percent in two runs; the recovery of activity of 22.4 and 21.0 percent was made in the same two runs. The uncorrected melting point of the product varied from 172° to 174° C. The synthesis was facilitated by the use of newly designed apparatus.

**Solubility of DDT in the Fixed or Fatty Oils.** Of 13 edible oils tested, butter, soya, and coconut oil were the most effective solvents for DDT. Butter oil is capable of forming a 12.26 percent (w/v) solution of DDT at 25° C.

#### FOOD RESIDUE STUDIES:

**Establishment of Toxicology Laboratory at Wenatchee, Wash.** A laboratory has been established at Wenatchee, Wash., chiefly for the purpose of evaluating the effect on human health of residues of economic poisons on foods. The laboratory will also undertake problems involving occupational hazards presented by pesticides.

#### RODENTICIDES STUDIES:

**Laboratory Studies with Warfarin in Bait Fed to Wild Norway Rats.** The results with wild Norway rats were not significantly different from those reported earlier for albino rats.\*

**Laboratory Studies of the Relative Cost of Using Different Concentrations of Warfarin against Roof and Norway Rats.** On the average, roof rats survive longer and consume more warfarin-poisoned bait, and therefore, cost more to kill than Norway rats. It is distinctly more expensive to use the highest bait concentrations tested than to use concentrations of approximately the commercial range. Some slight advantage in cost might be

\* See CDC Bulletin X(3): 32-33, March 1951.



gained by using concentrations below the commercial range (usually 0.25 mg./gm.) but the difference is probably not significant for either species of rat studied. There is certainly no indication that the cost of finished bait is increased when low, but effective, concentrations of warfarin are used. On the other hand, there is a marked and continuous decrease in the amount of warfarin actually consumed by rats before death as the bait concentration is decreased. This has a bearing on secondary poisoning. Further, such hazard as warfarin may present to man and domestic animals is directly proportional to the bait concentration.

**Laboratory Studies of the Effect of DDT upon Wild Rats when Applied as a Tracking Dust.** It might be economical from the standpoint of operations to increase the concentration of DDT in pyrophyllite above that now used for control of rat fleas, if such a formulation would also be effective for the control of rats. Jar and runway tests have been made in the laboratory. In the runway tests, all of the Norway rats died as a result of 20 or fewer exposures to 50 percent DDT, but 3 of the group of 10 roof rats are still alive and apparently normal after 62 exposures. The reason for the difference in survival time of Norway rats and roof rats is not known. Whether the roof rats are more resistant to DDT or their preening habits are such that the roof rat actually consumes less DDT than the Norway rat was not determined. In any event, the laboratory tests suggest that very inferior results would be obtained under field conditions by using 50 percent DDT for the control of roof rats.

**Simulated Field Studies of the Effect of DDT upon Norway Rats when Used as a Tracking Dust.** The results of a simulated field study do not indicate that 50 percent DDT and pyrophyllite would be fully effective as a rodenticide for the control of commensal rats.

**Baiting Problems Encountered with Dry Cereal Baits Offered to Norway Rats.** Examples are given to show that it may be difficult or impossible to induce rats which have easy access to an abundance of food to take any semipermanent bait, irrespective of whether that bait contains a poison or not.

## **EQUIPMENT DEVELOPMENT STUDIES**

### **AIR-BORNE PATHOGENS STUDIES:**

**Development of Air Jet Ejectors.** Use of air jet ejectors to create the necessary suction required for collecting uncontaminated air samples has certain advantages, and their operation is

inexpensive when compressed CO<sub>2</sub> is used as the motive gas. Ejectors can be designed to move any desired amount of air at high vacuums. Three sizes of ejectors have been developed which will pull approximately ½, 2, and 4.5 cu. ft. of air per minute depending upon the pressure of the motive gas and the restriction of the inlet to the sampling device. The air jet ejectors are particularly useful for air sampling under field conditions where a number of stations must be operated simultaneously at some distance from each other under such circumstances that the distribution of electric power for vacuum pump operation becomes a problem.

**Tangential Jet Sampler.** A tangential jet sampler has been adapted to the needs of the air sampling program by the use of a standard 125 ml. Erlenmeyer flask having an inlet near the bottom. An aluminum tube passing through the inlet and held by a rubber stopper extends the jet very close to the liquid media allowing the air stream to penetrate the liquid before being dissipated. The sampler is simple to construct and operate, and does not require the use of antifoaming agents. Preliminary results indicate it will give quantitative results comparable to those given by other types of impingement devices.

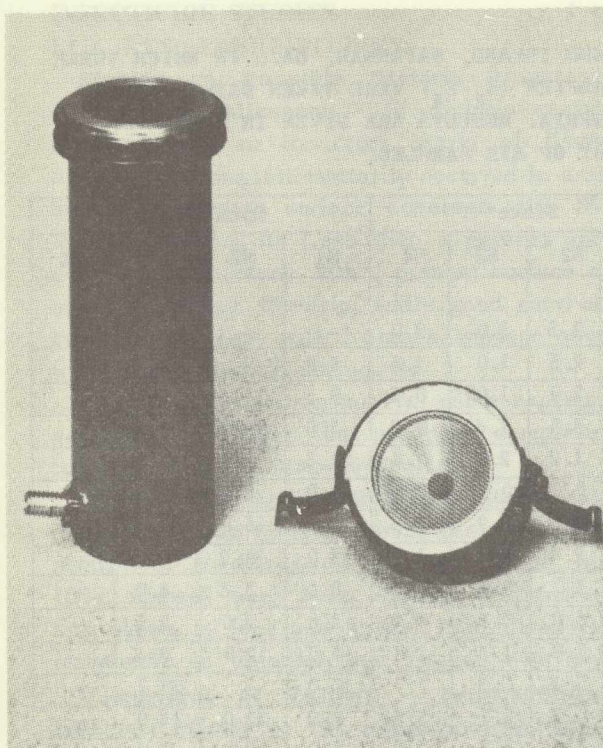
**Air Flow Meter.** Manometer-orifice type air flow meters used by the cooperating air sampling stations have been modified and recalibrated to permit measurement of higher rates of flow. The meters are now suitable for measuring air flows up to 1.0 cu. ft./minute.

**Tangential Jet-Molecular Filter Air Sampler.** A sampler has been constructed which permits the use of unmounted hydrosol-type molecular filters for collecting air-borne bacteria. Made of metal, the sampler passes air first through a water pool and then through the molecular filter; at the end of the sampling period, the sampler is inverted and the water is passed through the molecular filter. The unit is arranged so that the sampling technique is easy and rapid.

**Routine Sampling of Air for Bacteria.** Routine air sampling, including the culture of bacteria, is being carried out at the Savannah, Ga., laboratory to help establish normal base lines on kinds and quantities of pathogens present in the atmosphere, and to test under everyday use air sampling devices obtained or constructed by the laboratory.

**The Bubbler Sampler.** Results obtained with the bubbler sampler after 30 days' use indicate this method of sampling to be inadequate for giving





The tangential jet-molecular filter air sampler with the cap removed showing the screen support for the filter membrane, the air chamber, and the tube behind it.

significant colony counts in areas of low contamination density as represented by conditions at Oatland Island, Ga. Foaming and loss of media are excessive despite the use of olive oil as a suppressant.

**The Sieve Sampler.** Routine air sampling has been carried out using the sieve sampler to pass 15 cu. ft. of air at 1 cu. ft./minute onto nutrient media in petri dishes. Results obtained by this and other sampling methods are shown in table 1.

**The Open Plate.** Open petri dishes containing nutrient media were exposed, concurrently with the other sampling methods, for a 15-minute period. Resulting bacteria colony counts could not be reduced to a unit volume basis, but the total count served as a rough check on the volumetric sampling methods.

#### EQUIPMENT FOR THE APPLICATION OF MELTED INSECTICIDES:

Dispersal of hot liquid DDT has been accomplished on an experimental basis using compressed air as the propellant, but problems involving melting of powdered DDT have required additional work to adapt the laboratory sprayer to meet field oper-

ating requirements. Melting is necessarily a slow process since temperatures above 100° C. cause dehydrochlorination and subsequent polymerization of the DDT; thus, use of the heated sprayer to melt the DDT results in considerable loss of spraying time. To overcome such delays, it has been found expedient to premelt the DDT for use in the sprayer.

**Melting Equipment.** Melting of the powdered DDT without overheating has been accomplished by use of a double boiler utilizing steam coils located in the melting pot. A less bulky melting tube 10 in. long has also been made from 1-½ in. diameter aluminum tubing wound with Chromel A electric heating wire. A variable voltage transformer permits control of the temperature and a slight air pressure introduced into the tube discharges the melted DDT through a strainer and stopcock.

**Spraying Equipment.** A sprayer for dispensing melting insecticides has been constructed by modifying a 168 ml. capacity "Sure Shot" standard insecticide sprayer. The unit resembles a paint spray gun except for the addition of the heating element, made by winding Chromel A heating wire around the container. Temperature, usually held around 95° C., is controlled by a variable voltage transformer with 110 volt AC input. A pressure of 100 p.s.i. is used to discharge the melted insecticide, this being supplied from a portable 500-cu. in. lightweight air tank carried by the operator. A special rotating vane type nozzle discharges a cone-shaped spray pattern and is rated at 3-½ gm./second at 100 p.s.i.

#### CUT-OFF VALVE TESTS:

**Kingston Shut-off Valve No. 253-A.** This shut-off valve for use on hand sprayers gave good results when operated on the mechanical test rack and should prove to be a satisfactory valve for field use.

**Dobbins Shut-off Valve No. 8689.** When operated on the test rack with 5 percent DDT xylene emulsion circulating through it, this valve became inoperative at the end of 72 hours due to swelling of the rubber tip on the plunger stem.

#### HAND SPRAYER TESTS:

**Insecticide Sprayer-Dobbins Model 44-SS "Special."** This 4-gal.-capacity stainless-steel hand-pumped insecticide spray can has several features which make it suitable for all-purpose insecticide spraying including the use of water-wettable and solvent-type sprays. Satisfactory results were obtained during a limited period of laboratory and field testing.



Table 1

RESULTS OF THE AIR SAMPLING PROGRAM ON OATLAND ISLAND, SAVANNAH, GA., IN WHICH THREE TYPES OF SAMPLERS WERE EMPLOYED AND FOUR SAMPLES ( $S_1$ - $S_4$ ) WERE TAKEN DAILY IN EACH. INCUBATION WAS FOR 48 HOURS ON NUTRIENT MEDIA. RESULTS ARE GIVEN IN NUMBER OF COLONIES PER CUBIC FOOT OF AIR SAMPLED.

Sampler	Bubbler*				Sieve*				Open Plate**			
	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
January												
5	—***	—	—	—	15.0	2.5	1.0	3.0	—	—	—	—
8	—	—	—	—	6.0	2.5	1.0	4.5	6.8	—	—	—
9	—	—	—	—	0.5	2.0	1.07	0.5	9.6	1.5	—	—
10	—	—	—	—	0.6	3.8	1.4	0.2	3.8	23.7	8.4	—
11	0	59	0	0	0.4	1.2	2.8	0.4	21.3	2.1	—	—
12	—	0	0	—	0.5	0.7	0.7	0.7	4.0	2.6	1.0	—
15	11.0	12.8	7.7	—	0.3	3.8	2.9	2.5	—	16.0	11.0	—
16	—	—	—	—	3.0	2.4	3.1	1.7	13.0	18.2	13.5	—
17	0	5.5	3.3	2.2	1.1	1.7	0.8	0.8	8.0	3.6	3.0	—
18	0	5.5	1.8	2.2	1.6	1.8	0.6	0.4	4.0	2.0	2.5	—
19	—	—	—	—	2.0	1.9	1.4	1.8	10.0	19.0	3.2	—
22	—	25.6	—	—	4.2	5.1	6.3	7.7	46.0	—	21.7	—
23	1.8	1.5	3.4	4.6	7.3	7.3	5.7	3.5	9.0	22.0	14.0	—
24	4.6	1.5	4.6	3.7	1.9	4.0	3.7	2.4	1.0	2.0	3.0	2.0
25	—	3.7	1.4	—	1.5	3.0	3.2	6.2	9.0	26.0	28.0	18.0
26	0	0	67.0	44.0	—	—	2.4	1.6	9.0	13.0	14.0	2.0
29	0	0	0	0	1.3	1.2	4.5	1.6	1.0	4.0	25.0	10.0
30	0	0	3.3	0	0.7	1.3	2.5	1.3	4.0	2.0	6.0	5.0
31	0	1.1	—	—	0.9	2.4	1.2	—	5.0	3.0	9.0	2.0
February												
1	—	19.8	—	—	—	—	—	—	16.0	24.0	22.0	6.0
2	—	—	—	—	2.1	2.5	0.8	0.3	2.0	2.0	4.0	1.0
5	0	0	21.6	0	1.5	1.0	1.9	0.7	1.0	1.0	3.0	1.0
6	—	—	43.2	0	0.3	0.4	0.6	0.5	1.0	1.0	0	3.0
7	8.6	29.0	—	13.0	3.2	3.1	2.8	2.4	44.0	38.0	48.0	50.0
8	56.2	65.0	21.6	102.0	0.9	0.9	1.2	1.1	4.0	2.0	2.0	2.0
9	9.4	21.6	0	8.7	1.3	2.1	3.9	0.7	2.0	3.0	10.0	7.0

\*Adjusted to a 15-cu.-ft. sample at 1 CFM, colonies per cubic foot.

\*\*Adjusted to a 15-minute exposure, total colonies.

\*\*\*Dashes indicate no sample.

#### TAPE CALIBRATION FOR CONTINUOUS RECORDING PARTICLE SAMPLER:

A continuous recording particle sampler was operated continuously for 18 days to calibrate the rate of tape movement. Results show the initial movement of the tape to be 0.47 in./hour on the first day and 0.77 in./hour on the 18th day, the increase resulting from the build-up of tape on the wind-up reel, thereby increasing its diameter.

#### GARBAGE TRUCK:

Further consideration and analysis regarding

the possibility of designing an inexpensive garbage collection truck for use by small towns in the 1,000 to 10,000 population class, has brought out the fact that definite recommendations for such a truck should await broader studies of individual community requirements. A sample survey of six small towns in southeastern Georgia pointed out that dump-type trucks with either scow-type bodies or conventional dump bodies are well suited to small town use because of low first cost and their suitability for hauling materials other than garbage.



## INSECTICIDE STUDIES

### FLY RESISTANCE STUDIES:

Studies on Possible Dieldrin Resistance in "Phaenicia pallescens." In dieldrin resistance studies with an insectary strain of *Phaenicia pallescens*, complete mortality occurred in a colony having 5 percent surface coverage with 25 mg. dieldrin per sq. ft. Less than 1 percent survival occurred in a colony with 1 percent surface coverage with 25 mg. dieldrin, while good survival occurred in a colony with 1 percent surface coverage with 10 mg. dieldrin per sq. ft.

*P. pallescens* shows survival under experimental selection conditions that produced complete mortality of standard *Musca domestica*.

Studies with Dieldrin-Resistant Strains of "M. domestica" from Phoenix, Ariz. Tests with Phoenix strains of *M. domestica* obtained during January 1951, showed much lower dieldrin resistance than that shown in June and August 1950. Considerable resistance to chlordan and lindane was evident.

Comparison of NAIDM\* 1948 and Regular Insectary Strains of "M. domestica" on Residues of Various Halogenated Hydrocarbon Insecticides. Mortality measurements on the NAIDM 1948 and standard insectary strains of *M. domestica* have shown no significant differences in comparative residual tests with deposits of DDT, methoxychlor, chlordan, and toxaphene.

### DEVELOPMENT OF FORMULATIONS FOR FLY CONTROL:

Relative Effectiveness of Various Halogenated Hydrocarbon-synergist Combinations against Resistant Strains of "M. domestica." Several insecticide combinations showing promising synergistic action in the rapid screening survey failed to give satisfactory kills in more detailed evaluation tests.

DDT-Hydroxypentamethyl Flavan Combinations. Deposits of 200 mg. DDT per sq. ft. alone and in combination with 20, 40, or 200 mg. hydroxypentamethyl flavan (HPMF) were applied as homogenized xylene emulsions. With 30- and 120-minute exposures, 1- and 4-week-old deposits were essentially inactive against two DDT-resistant strains of house flies. The HPMF combinations partially inhibited the action of DDT against nonresistant house flies. Further tests with xylene solutions and methyl ethyl ketone solutions of DDT and HPMF confirmed the inhibitory actions

indicated above.

DDT-Parachlorobenzaldehyde Semicarbazone Combinations. Biological effectiveness of DDT-parachlorobenzaldehyde semicarbazone deposits tested for 30- and 120-minutes 1 week after application was very low against two DDT-resistant strains of house flies. The combinations of the synergist with DDT did not inhibit action against a normal strain of house flies.

DDT-Phenyl Mercuric Acetate Combination. In tests against DDT-resistant strains of house flies, the effectiveness of 2-week-old combined DDT-phenyl mercuric acetate (PMA) deposits decreased as the PMA content was lowered. High mortality of nonresistant flies was obtained with all combined deposits. Deposits of 200 mg. PMA per sq. ft. had no effectiveness when evaluated 2 weeks after spray application.

DDT-DMC Combinations. Combined deposits of 200 mg. DDT and 200 mg. p-dichlorodiphenyl methylcarbinol (DMC) per sq. ft. have shown fairly effective residual toxicity against two DDT-resistant strains of the house fly over a 12-week test period. The DDT-DMC deposits in the ratio of 1:1 were better than deposits in the ratio of 10:1.

DFDT\*\* -DMC Combinations. Combined deposits of DFDT and DMC as 10:1, 5:1, and 1:1 mixtures based on 200 mg. DFDT per sq. ft. failed to give significant mortality of DDT-resistant strains of the house fly when tested 1 and 3 weeks after spray application.

Methoxychlor-DMC Combinations. Combined deposits of methoxychlor and DMC as 10:1, 5:1, and 1:1 mixtures based on 200 mg. methoxychlor per sq. ft. gave negligible 24-hour mortalities of DDT-resistant adult female house flies exposed to 1-week-old panels.

### DISINSECTIZATION OF AIRCRAFT:

Development of High Pressure Aerosols with Reduced Pyrethrum Content. Experimental formula S-83, containing 2 percent pyrethrum, 3 percent DDT, 0.5 percent piperonyl butoxide, and 1 percent MKG-264 was compared with standard formula G-382, at dosage levels of 1.5, 2.0, 2.5, 3.5, 4.0, and 5.0 gm./1,000 cu. ft. S-83 was equal to or slightly more effective than G-382 at all dosages tested.

Development of High Pressure Aerosols Containing Lethane-384. Experimental formula S-90, containing 2 percent pyrethrum, 3 percent DDT,

\*National Association of Insecticide and Disinfectant Manufacturers.

\*\*p,p'-flourine analogue of DDT.



2 percent lethane-384, 1 percent MKG-264, and 0.5 percent piperonyl butoxide, applied at 3 gm./1,000 cu. ft. gave 24-hour mortality of adult female house flies of 85.7 percent. This formula was markedly better than standard G-382 (mortality 65.3 percent) and was the best of those formulas containing 2 percent lethane-384. The same combination of DDT, pyrethrum, MKG-264, and piperonyl butoxide with 7 percent lethane-384 gave a 24-hour female mortality of 97.4 percent.

#### BIO-ASSAY TECHNIQUES:

**Calibration of Micro-loop Delivery Rates by a Spectrophotometric Method.** Calibration of delivery rates from a series of micro-loops was made using a redistilled benzene-Sudan III mixture and spectrophotometric application of the Bouger-Beer relationship. Satisfactory calibration of the loops was obtained using determinations made over a 10-day period.

**Effect of Dieldrin Solutions on Micro-loop Delivery Rates.** Tests were carried out to determine whether the inclusion of dieldrin in benzene solutions might influence volumes delivered from micro-loops. Five percent dieldrin-benzene solutions increased the volumes delivered an average of 1.63 percent over those of redistilled benzene alone. Twenty-five percent dieldrin solutions produced an average increase in volumes delivered of 1.83 percent.

#### INSECTARY PROCEDURES:

**Mosquito Investigations.** A study on the effect of temperature upon the viability of untreated *Anopheles quadrimaculatus* adults has shown increased mortality rates at temperatures over 79° F. even under limited 48-hour holding periods.

**Modification of Rearing Medium for Blow Flies.** One-half pound of hog lung seeded with 175 mg. of *Callitroga macellaria* eggs and replenished with an additional ½ lb. of lung on the second day after setting will produce approximately 1,400 pupae (average weight 36 mg. each). A seeding of 125 mg. of *P. pallescens* eggs, placed on ½ lb. of lung with an additional ¼ lb. on the second day will produce 1,600 pupae with an individual weight average of 24 mg.

#### CONTROL METHODS AND EVALUATION

##### STUDIES OF FLY ACTIVITIES:

**Study of Fly Resting Habits.** Limited observations during this winter quarter indicated that adult house flies did not survive below-freezing temperatures on screened premises on which observations were made. On unscreened premises, adult flies are reduced by freezing temperatures,

but there was some survival of flies inside the houses. Some emergence occurs during warm periods throughout the winter, but these adults are probably killed during the periods of freezing temperatures, except those which gain access to heated buildings.

##### MOSQUITO LARVICIDE INVESTIGATIONS:

**Control of "Mansonia peturbans."** Examinations of *Mansonia* larvicidal test plots 1 year after treatment with heavy dosages of benzene hexachloride, chlordan, dieldrin, aldrin, and parathion indicated that only the dieldrin had exerted any detectable effect on the rate of larval production in the test plots. Test results indicate the possibility of drastically reducing young *Mansonia* larvae with insecticidal residues on the bottom mud and debris of breeding areas.

##### PHARR, TEX., STUDIES

##### ENVIRONMENTAL SANITATION:

**Relative Fly Populations in Three Sanitation Study Towns.** Three-week moving averages of the fly population indices were recorded for the Anglo and Latin sections of Mission, Edinburg, and Pharr. All indices were lower for this period than for the same period in former years, due to the effects of several occurrences of subfreezing weather, and a continuing severe drought. In Pharr, where no sanitation practices are being encouraged, fly populations were consistently higher than in Mission and Edinburg, and the effects of the freezes were more pronounced. Anglo sections of all three towns continued to show much lower indices than Latin sections.

**Premises Sanitation Improvements.** Monthly premises sanitation surveys in the three towns showed, in general, an increase from the preceding quarter in the frequency of occurrence of most of the attractants under observation, and higher frequencies of premises with fly attractants in February than in January or March.

**Factors Affecting Fly Populations.** Studies of factors affecting fly populations showed increases for the present quarter in the frequencies of approved garbage containers in Mission and Pharr as compared with last quarter. Reductions in scattered garbage were in evidence in Pharr.

##### CHEMICAL FLY CONTROL INVESTIGATIONS:

**Studies of Day and Night Fly Resting Habits.** Studies of day and night resting habits of flies were continued to determine preferred resting places and seasonal trends. Ground surfaces and garbage in containers continued to be the princi-



pal daytime location of house flies, while tree limbs and bushes, and clothes lines were the principal nighttime locations. Ground surfaces in the daytime and grasses and weeds at night were the principal resting places for *Phaenicia* spp. There was a substantial increase in the numbers of

*Drosophila* near the end of the quarter. During the daytime, 97 percent of this species were found on garbage in containers, and 3 percent in privy pits. Nighttime locations of *Drosophila* were almost evenly divided between garbage in containers and privy pits.

## TRAINING SERVICES

### FIELD TRAINING

Table 1 shows the courses given by field training centers during the quarter.

**Amherst, Mass.** Final arrangements were made for two short courses to be held during April. A sewage plant operator's course was tentatively scheduled for April 2-6 and a rodent control course was planned for April 23-27.

**Bloomington, Ill.** Plans have been made for two 4-week courses for milk sanitarians beginning on June 18 and July 30, 1951. A food service training course was to be held in Chicago on May 8 for the airline commissaries.

**Buffalo, N. Y.** In the state of New York, milk inspectors are required to have a course in milk sanitation that has been approved by the New York State Public Health Council. Prior to the establishment of this center in Buffalo, a 2-week course was given during the summer period at Cornell University, Ithaca, N. Y. The 2-week portion of the environmental sanitation course devoted to milk sanitation has been approved by the Public Health Council to meet the State requirements pertaining to "a satisfactory course of instruction in milk sanitation." For this reason, additional trainees are usually enrolled in the milk portion of the environmental sanitation course.

**Denver, Colo.** The technical committee of the Colorado Public Health Association for studying private sewage disposal methods in the State has presented the following results of studies made in the Tri-County area around Denver:

a. The average water consumption of 50 restaurants was found to be 1,200 gal. per day

regardless of the number of persons served.

b. The average daily usage of water at 63 taverns was found to be 1,200 gal. per 100 patrons.

c. The average daily water consumption of 50 trailer camps was 75 gal. per trailer unit.

**Pittsburgh, Pa.** Arrangements have been made with the Pennsylvania Department of Health and the Pennsylvania State College to conduct semiannual training courses in dairy farm sanitation. This 2-week course, to be held in the School of Agriculture at Penn State, is designed to train selected personnel among the 600 "approved dairy farm inspectors" in Pennsylvania.

Recent developments in public health in Pennsylvania have been attributed in a large part to the activities of the State Tuberculosis and Health Society and other voluntary health agencies. With the expected introduction and passage of permissive legislation for the establishment of county health departments in this State, interpretation of these regulations to the communities by voluntary health organizations will be of prime importance in improving public health services in this State. It is for this purpose that the Tuberculosis and Health Society has requested the field training center to sponsor a course for the training of its State and local personnel in public health practices, recommendations of the APHA State survey, and the relationship between official and voluntary health agencies. The date for the first course of this type has been placed tentatively as immediately following Labor Day.



**Table 1**  
**COURSES PRESENTED BY FIELD TRAINING CENTERS**

Course	Type of Course	Location of Center	Duration (Weeks)	Dates (1951)	Students	
					Organizations Represented	Total
Milk-Laboratory Procedure	Regularly scheduled	Amherst, Mass.	1	Feb. 5-9	State and local health departments, and dairies	12
Environmental Sanitation	Regularly scheduled	Amherst, Mass.	12	Feb. 26 to May 18	U. S. Air Force, State and local health departments	17
Milk Sanitation	Special	Bloomington, Ill.	4	Jan. 15 to Feb. 9	Dairy fieldmen	5
Environmental Sanitation	Regularly scheduled	Bloomington, Ill.	12	Feb. 19 to May 11	Local health departments	5
Environmental Sanitation	Regularly scheduled	Buffalo, N. Y.	12	Jan. 2 to Mar. 24	Local health departments	15 plus 5 part-time
Environmental Sanitation	Regularly scheduled	Columbus, Ga.	12	Feb. 5 to Apr. 27	Navy personnel, Public Health Service, and local health departments	15 plus 1 part-time
Milk Sanitation	Special	Columbus, Ga.	1	Jan. 22-26	Communicable Disease Center	5
Environmental Sanitation	Regularly scheduled	Denver, Colo.	12	Jan. 8 to Mar. 29	State health department, Navy	11 plus 1 part-time
Laboratory Workshop	Special	Denver, Colo.	1	Feb. 26 to Mar. 2	Laboratory technicians of public health laboratories	22
Environmental Sanitation	Regularly scheduled	Denver, Colo.	12	Mar. 19 to June 8	Health departments of Hawaii	10
Housing Seminar*	Regularly scheduled	Denver, Colo.	1	Mar. 19-23	State and local health departments, welfare departments, planning commissions, building departments, and Federal Housing administration	80
Environmental Sanitation	Regularly scheduled	Pittsburg, Pa.	12	Mar. 19 to June 8	State and local health departments	11
Housing Sanitation	Special	Syracuse, N. Y.	1 day	Jan. 23	Students, Syracuse University	8
Housing Sanitation	Special	Syracuse, N. Y.	1 day	Mar. 27	Students, Syracuse University	8
Milk Sanitation	Regularly scheduled	Topeka, Kans.	2	Jan. 15-26	State and local health departments and industry	14 plus 44 part-time

\*Held at Regional Office in Denver in cooperation with Colorado State Health Department, Housing Sanitation Section; Training Services, Atlanta, Ga.; and Public Health Service Region IX.

**Table 2**  
**HEADQUARTERS TRAINING COURSES**

Course	Type of Course	Location of Center	Duration (Weeks)	Dates (1951)	Students	
					Organizations Represented	Total
Control of Animal Reservoirs and Vectors of Disease	Special	Atlanta, Ga.	4	Feb. 5 to Mar. 2	Army preventive medicine personnel	16
Rat Control	Regularly scheduled	Atlanta, Ga.	3	Mar. 12-30	Instructor, Tuskegee Institute, Tuskegee, Ala.	1
Insect and Rodent Control*	Special	Atlanta, Ga.	1	Feb. 26 to Mar. 2	Navy personnel, Public Health Service and local health departments	16
Housing Sanitation	Regularly scheduled	Atlanta, Ga.	5	Jan. 10 to Feb. 9	State and local health	1 plus 1 part-time
Housing Sanitation	Regularly scheduled	Atlanta, Ga.	5	Mar. 19 to Apr. 21	Housing survey project	1

\*Held at Columbus Field Training Center, Columbus, Ga.



## STATE FIELD TRAINING (COOPERATIVE ENTERPRISE)

**California.** Mr. Clyde F. Fehn, for the past 2 years in charge of the Insect and Rodent Control Section, Training Services, reported for duty in January to the California State Health Department to assume his duties as training officer in environmental sanitation.

**Maryland.** The fourth course in environmental sanitation began January 8 with five trainees enrolled. On the completion of this course, all of the State sanitarians will have attended this or similar courses.

**New York.** Plans were completed for conducting four courses for water and sewage treatment plant operators. They are as follows: (a) a Grade II course for water treatment plant operators, March 26 to April 7, Cornell University; (b) a Grade II course for sewage treatment operators, April 9-26, New York University; (c) a Grade III course for water treatment operators, April 23-25, Albany, N. Y.; and (d) a Grade III course for sewage treatment plant operators, April 26-28, Albany, N. Y.

**South Carolina.** The first 8-week course in environmental sanitation began on February 5. There were 34 men attending this course, 27 from local health departments and 7 Navy personnel from the Sixth Naval District.

## HEADQUARTERS TRAINING

Table 2 shows headquarters training courses presented during the quarter.

## TRAINING PUBLIC HEALTH PERSONNEL FROM OTHER COUNTRIES:

Special observation and training programs were arranged for six public health workers from other countries who visited Training Services. They represented the Belgian Congo, England, India, and Mexico.

Special training also was arranged for five Public Health Service officers who will be assigned to countries in Southeast Asia under the ECA program. Four of this group were medical officers, and the fifth was a sanitary engineer. They will be assigned to Indo-China, Burma, or Iran.

## OTHER HEADQUARTERS ACTIVITIES

Mr. Ralph Barnes returned from the University of Minnesota on January 2 and assumed charge of the Insect and Rodent Control Section.

## CONFERENCES:

The over-all schedule for the 3-month ECA training program was completed at a meeting of the Division of Commissioned Officers committee with the exception of final details to be worked out for the field training portion of the course to be held at Atlanta and Columbus, Ga.

## TRAINING MATERIALS:

Twelve new project requests were prepared and submitted, covering the fields of individual water supplies, individual sewage disposal, automatic dishwashing equipment, railway watering, point sanitation, rodent control, and swimming pools. Following a request for slides on dairy equipment and processing plants, a project was initiated to provide this material.

Assistance was given in story development leading to initial drafts of scripts for the following projects: Laboratory Control for Milk Sanitation; Sanitary Construction of a Drilled Well; Better Sewage Treatment; and Storage and Collection of Refuse.

The following projects were approved: The High Temperature-Short Time Pasteurization Process; Inspecting and Testing High Temperature-Short Time Pasteurization Equipment; Basic Principles of Refrigeration; and Principles of Refrigerated Food Storage.

## EVALUATION:

The experimental form of the achievement test for the environmental sanitation field training program has been administered as a pretest to 184 trainees and as a posttest to 102 trainees - or one-half the number pretested. It is estimated that the goal of administering the test to 200 trainees will be reached the latter part of August. Five regional field training centers and two State field training centers are participating in the program.



Veterinary Medicine, Davis, Calif., on the thermal deathtime studies have been made by holding the Henzerling strain of *Coxiella burnetii* at 146° F. for 30 minutes when suspended in skim milk in a concentration of approximately 100,000 infectious guinea pig doses. In these laboratory pilot experiments, the organism did not survive this time-temperature combination. These experiments will be repeated for confirmation, and new experiments are now under way at temperature of 145° F. for 30 minutes. Follow-up on the laboratory phases of the testing will be done under commercial conditions as soon as the large equipment is installed.

Three new sources of milk containing viable *C. burnetii* organisms have been uncovered. Work is continuing in this phase of the project with an attempt to reveal the distribution of herds producing milk containing this organism, the constancy with which the milk delivered by these producers contain the organism, the infectiousness of this milk for guinea pigs, and the fate of the organism in the milk as it is subjected to commercial pasteurization procedures.

**Epizootiological Project.** An attempt was made to infect five lactating cows by feeding yolk sac suspensions on moistened grain. Cows were exposed at weekly intervals over a period of a month, each animal ingesting about  $2 \times 10^9$  infectious guinea pig doses of *C. burnetii*. At 100 days after exposure, no evidence of infection has been obtained. In contrast, the inhalation of 100 infectious guinea pig doses has resulted in infection.

Further experiments on the exposure of cattle to *C. burnetii* through inhalation were started. Two more cows (nonpregnant) were exposed to 1,000 minimal infectious guinea pig (MIGP) doses by inhalation. At 73 days after exposure, these cows failed to show evidence of infection. This is a part of the study on the effect of age, pregnancy, and stage of lactation on susceptibility to *C. burnetii* infection.

The calfhood vaccination trial has been continued. Specimens collected at monthly intervals are being tested for evidence of shedding of *C. burnetii*. At 6 months after inoculation, some of the calves still possess complement-fixing antibodies.

#### TRICHINOSIS SURVEY

Following the recent human outbreak of trichinosis in Seattle, Wash., a survey was begun on hogs slaughtered for local distribution in the Seattle area. It was decided to start with the largest packer to try to obtain a measure of the

trichinosis infestation of the hogs processed in this plant. In cooperation with the owners and the meat inspection service of the U. S. Bureau of Animal Industry, 100 samples are being taken daily, representing about one-fourth of the number of hogs slaughtered per day. Each specimen is being examined three times under the trichinoscope at the State health department laboratory. As soon as preliminary results indicate a trend, the investigation will be expanded on a wider scope.

#### PROPOSED CREEPING ERUPTION STUDIES

As a follow-up on the survey of the incidence of dog hookworm in the creeping eruption areas of Florida, laboratory and field studies on control are proposed. Pilot experimental studies will be carried out to test various larvicidal agents on soil infested with larval cultures of *Ancylostoma braziliense* and *Ancylostoma caninum*. This will be followed by a field study in areas where creeping eruption is highly endemic in the human population. Control measures such as the application of soil larvicides in contact areas will be measured in terms of human incidence in those areas as well as soil larval counts on a sampling basis.

#### MEAT AND POULTRY HYGIENE

Educational, legislative, and advisory activities for the improvement, expansion, and standardization of meat and poultry sanitation and inspection facilities were increased in Texas, Florida, Colorado, and Washington. These activities included surveys of local meat packing establishments, markets, and facilities for carrying out adequate sanitation and inspection facilities through the administration of the local health jurisdictions.

#### CIVIL DEFENSE

The veterinary public health personnel of many of the States have been active in the planning and organization of civil defense in connection with the over-all public health phases of the defense program.

#### PSITTACOSIS

In Florida, a survey of selected bird farms was made to check on the minimum sanitary and quarantine standards for preventing the introduction and spread of psittacosis among the psittacine bird colonies.

#### REPORTING SYSTEM

Indiana is initiating a reporting system on a voluntary basis with the practicing veterinarians of the State for those diseases of animals which are of public health significance.



## REGULAR CORPS EXAMINATION FOR SANITARY ENGINEERS

Competitive examinations for the appointment of officers as Sanitary Engineers in the Regular Commissioned Corps of the U. S. Public Health Service will be held in various cities throughout the country on August 6, 7, and 8, 1951. The examination will include professional written tests, an oral interview, and a physical examination. Completed applications must be in the Washington office by July 9, 1951.

Appointments are permanent and provide opportunities for career service in research and public health activities. Appointments will be made in the grades of Assistant and Senior Assistant, equivalent to Navy ranks of Lieutenant (j.g.) and Lieutenant, respectively. Entrance pay for an

officer with dependents is \$4,486 in the Assistant grade and \$5,346 in the Senior Assistant grade, including rental and subsistence allowance. Applicants must have a bachelor's degree in engineering, preferably in civil, sanitary, or chemical engineering, and must complete by May 1952, a total of at least 3 additional years of professional training and experience. At least 2 years of the required experience must have been in public health or an acceptable related field.

For application forms and additional information write to: Surgeon General, U. S. Public Health Service, Federal Security Agency, Washington 25, D. C., Attention: Division of Commissioned Officers, DESK A.

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## RECENT PUBLICATIONS BY CDC PERSONNEL

- Frobisher, M., Jr., and Parsons, E. I.: Differentiation of *minimus* type *C. diphtheriae* by slow fermentation of dextrose. *Science*. 113 (2934): 317 (1951).
- Goldman, M.: Iron alum-picric acid-hematoxylin, a progressive, sequence stain for tissues. *Am. J. Clin. Path.* 21(2): 198-200 (1951).
- Henderson, J. M.: Irrigation and mosquito problems. Presentation at nineteenth Annual Conference of California Mosquito Control Association, Riverside, Calif. (March 1951).
- Simmons, S. W.: Some current developments in the use of economic poisons. *Proc. of Annual Meeting, Southern Branch, APHA, Birmingham, Ala.* (1950).
- Stoenner, H. G.: Experimental Q fever in cattle — epizootologic aspects. *J. Am. Vet. M. A.* 118 (888): 170-174 (1951).
- Stoenner, H. G.: Isolation of *Brucella abortus* from sheep — *J. Am. Vet. M. A.* 118(887): 101-102 (1951).

## CHARLESTON, W.VA. FALL FLY WEEK

*Musca publicica: Charleston Experiments with a New Species of Fly Publicity*, a handbook showing how one city publicized its fly control program, has been compiled for distribution by CDC. Items included are an article on "The Charleston Story"; four press releases; some pages from the scrapbook showing how the newspapers used this background material to build stories, pictures, and editorials; ten radio announcements; two school booklets; a 20-minute speech for a civic club; a proclamation by the mayor; and a letter of thanks.

This handbook is available from:

Medical Director in Charge  
Communicable Disease Center  
U. S. Public Health Service  
Fourth Floor  
50 Seventh Street, N. E.  
Atlanta 5, Ga.



# MORBIDITY TOTALS FOR THE UNITED STATES \*

## MALARIA, POLIOMYELITIS, TYPHUS

1950 - COMPLETE 1951 - AS REPORTED

